Syntax and Semantics of English Partitive Noun Phrases: A Phrase Structure Account

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Declaration

I declare that this thesis has been composed by myself and that the research which is reported herein has been conducted by myself unless otherwise indicated.

Colin Matheson

Edinburgh, 5th May 1990

Acknowledgments

Many people have helped in a variety of ways in the generation of this text. I am very grateful to everyone mentioned below.

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Abstract

This thesis presents a phrase structure account of a particular class of English noun phrases; partitives. Constructions which are directly related, notably pseudopartitives, are also analysed, and the proposals have implications for the representation of simple noun phrases. The main aim is to provide a concise and explicit account of the data and to this end the syntactic rules are presented in a computer-usable form.

The background to the analysis is provided by reviewing a number of seminal accounts of noun phrase structure, and there is also a review of some research on the semantics of noun phrases which directly bears on the work presented here. In the absence of a semantic theory which captures all the relevant facts, some requirements are stated and some directions indicated.

The thesis makes a number of specific claims, among which are the following:

- Partitive noun phrases are minimally distinct from simple and pseudopartitive noun phrases syntactically and semantically.
- Genitive partitive noun phrases in Old English and in languages such as modern German and Polish are closely related to the modern English partitive form.
- The partitive definiteness constraint must be reformulated.
- The phenomenon of definiteness should be treated in a theory which allows interaction with the domain of discourse.

The main contribution of the thesis is in the provision of a precise, practical, and theoretically motivated grammar of English noun phrases which aims to generate, as nearly as possible, 'all and only' the required strings of the language.

Notational Conventions

The general notational conventions below are followed in the thesis. Other usages are introduced in the text where appropriate.

Convention	Example
1. Linguistic examples in the main text appear in italics	The noun phrase *some of the women* is a partitive
2. Quotations in the main text appear in double quotes	Barwise and Cooper call this the "fixed context" assumption
3. Semi-technical and technical expressions are introduced in single quotes	The terms 'strong' and 'weak' are attributed to Milsark
4. Ill-formed examples are preceded by a star	* Many some mistakes
5. Questionable examples are preceded by one or two question marks	? Very much of the table
6. Very questionable examples are marked using a question mark and a star	?* How much of the frescoes?
7. Italics are used for logical symbols	$f(x) = f(y)$
7. Examples are identified using the chapter number, a dash, a number, and an optional letter	As shown in (2-13b)

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Introduction

> The investigation of noun phrase structure ... is not without its difficulties (Selkirk 1977)

Some of the difficulties in determining noun phrase (NP) structure are investigated in this thesis, and some solutions are suggested. My original intention was to provide an analysis of NPs, and particularly of partitive NPs, which would expand on the rather rudimentary Generalised Phrase Structure Grammar (GPSG) account which appears in Gazdar et al. (1985) by describing a much larger range of constructions. The rules in chapters 2 and 3 provide such an extension in a framework which is in all important respects a direct relative of GPSG. However, the grammar has been influenced in a number of ways through being put to use in a speech recognition system; these influences are discussed below in section 0.1. This introduction therefore serves to outline the assumptions which have shaped the thesis and to provide an overview by summarising the contents of each chapter.

I am assuming that a concise, theoretically motivated, and computationally tractable account of NP structure is a highly desirable end in itself. A large amount of effort has been spent in recent years on producing such working grammars; notably in projects in the ESPRIT (e.g. Calder et al. 1988) and Alvey (e.g. Grover et al. 1989) research initiatives. The grammar which was developed in the latter project is particularly relevant to the work which is reported in this thesis, partly because the grammar development environments are very similar and partly because the theoretical background is more or less identical. In effect, the NP grammar contained herein can be regarded as a proposed substitute for the Alvey NP rules which describe partitives. However the grammar in chapters 2 and 3 also constitutes an extension to the Alvey

grammar as analyses are provided for certain types of NP, notably pseudopartitives, which are not handled by the latter.

It must be accepted that the range of constructions which are analysed in the thesis does not in any sense constitute a comprehensive noun phrase grammar. Important constructions such as comparatives, relative clauses, compounds, and so on, are not discussed at all except on the few occasions where the data bear on the topic in question. The analysis of basic partitive configurations has proved to be complicated enough.

The speech recognition system which uses the syntactic rules in chapters 2 and 3 was developed in the Centre for Speech Technology Research at the University of Edinburgh. The grammar was adapted for the Edinburgh University Speech Input Project (EUSIP) initiative, and for this reason it will be referred to as the SIP grammar (Matheson et al. 1988). The practical dimension has had some effect on the design and content of the grammar and some points are made below in justification of this influence.

0.1. Desiderata

It was suggested above that there are three important desiderata which affect the form of the SIP grammar rules; concision, theoretical soundness, and computational tractability. The question of what constitutes computational tractability is to some extent open to debate. It is generally accepted that context free accounts of phrase structure are more easily implemented than more powerful formalisms, and as GPSG is designed to be context free, this is an argument for working within the theory. However, not all implementations of GPSG are equally tractable, and I shall interpret the notion here to mean simply that the rules should be directly interpretable by a parser, leaving aside such issues as parser design. On this interpretation the SIP grammar fulfils the

criterion. The question of concision is discussed briefly at the end of chapter 3; it will suffice here to note that thirteen phrase structure rules in all are used to analyse basic simple NPs, a large range of partitives and pseudopartitives, and simple adjective phrases.

The main issue which must be discussed at this point is the question of the theoretical motivation behind the SIP grammar. As noted previously, the original aim was to expand on Gazdar et al.'s (1985) account of NP structure, and the adoption of GPSG means that there are subsequently two important sides to the question of theoretical motivation. Firstly, the sense of theoretical motivation behind GPSG itself is relevant, and this topic is discussed briefly below with reference to some of the comments made in Gazdar et al. (1985). The other side to the question of what theoretical motivation means here concerns the need to justify the effect that the practical use of the grammar has had on its form and content.

To begin with the background to GPSG; perhaps the most important point is that a grammar should be as explicit as possible, and the SIP grammar goes at least one stage further than Gazdar et al. (1985) in providing an actual implementation. This can be interpreted as an attempt to fulfil the first of the three methodological assumptions which guided GPSG:[1]

> A necessary precondition to 'explaining' some aspect of the organisation of natural languages is a description of the relevant phenomena which is thorough enough and precise enough to make it plausible to suppose that the language under analysis really is organised in the postulated way. (Gazdar et al. 1985, p.2)

Another important factor in the methodological design of GPSG concerns the relationship between syntax and semantics. Gazdar et al. argue that this

[1] The other two assumptions behind GPSG are not so relevant here as they relate on the one hand to the interpretation of what a grammar should be in a formal language sense and on the other to statements of

relationship should be as well-defined as possible, and I am accepting this stricture (1985, pp.6-8). Problems arise in certain places below in trying to specify exactly what the relationship should be, particularly when the semantic phenomenon of definiteness is involved, but the general approach is assumed to be well-founded. Gazdar et al. also suggest that the use of semantics as a well-formedness filter on syntactic structures is mistaken (1985, pp.9-11), and it could be argued that some of the argumentation concerning the 'partitive constraint' in chapter 2 breaks this convention. However, the grammar itself does not explicitly rely on further semantic filtering and so complies with the constraint.

The other side to the question of theoretical motivation, as pointed out above, concerns the actual form and coverage of the rules in the SIP grammar. In one sense, it is arguable that linguistic theory, at least in the form of generative grammar, need not play any rôle at all in the kind of language modelling which is necessary for applications like EUSIP. The most successful speech recognition devices in existence use stochastic models of syntactic knowledge; obvious examples are SPHINX (Lee 1988) and the various IBM systems (see, for instance, Brown et al. 1988). There are a number of ways to respond to this argument, but the most cogent is perhaps to point out that there is a difference between a speech recognition system and a speech understanding system. The existing successful programs have as a final aim the straightforward recognition of the spoken words. As the systems become more accurate the range of possible applications is widening (to include, for example, database query tasks), and mere recognition is no longer enough. It is increasingly true that there is a necessity for the input to be translated into a representation of meaning, and stochastic techniques cannot fulfil such requirements by themselves. Many research centres are therefore working on techniques for employing efficient

linguistic universals.

natural language parsing systems using grammars as knowledge sources as a first step towards structuring speech input for semantic translation; the SIP grammar represents one such knowledge source.

Another problem with relying solely on statistical approaches to language modelling concerns the question of the generality of the models which result. There is some discussion of this topic in Taylor, Briscoe and Grover (1989). It will be sufficient for present purposes to point out that the statistical approaches rely on corpora and that there are important issues concerning the amount of material which is necessary for reliable modelling. Some IBM systems, for example, uses three-word Markov models which are built from many millions of words of corpus, and it is not clear that this approach is ultimately practicable for large-scale language coverage. It has been an accepted point among linguists, at least since Chomsky (1957), that finite state representations of language are inadequate, and the debate about the ultimate worth of any form of Markov modelling must take these arguments into account. Note that this is not an argument against the value of studying corpora when constructing linguistic theories; it is possible that the emphasis on data which are the result of introspection has hindered progress in linguistics in some respects, and some of the argumentation in chapter 3 explicitly uses facts drawn from corpora to justify the inclusion of particular constructions. It is inescapably true that attempts to model corpora uncover common constructions which are seldom discussed in the theoretical literature; the analysis of specifier nouns in chapter 3 is an example of an attempt to describe such a construction in a manner which is as theoretically respectable as possible. It is arguable that problems will ultimately arise when corpora are used in what is essentially a simplistic approach to language modelling, no matter how useful such strategies may be in the short term.

Accepting, therefore, that there is a growing need for precise grammars in practical applications such as speech recognition and understanding, there are many theoretical questions to be asked on the subject of which kind of grammar is most suitable. The model chosen here, a context free phrase structure grammar, is in some ways not the obvious choice for speech applications in which it is arguable that the input should be parsed incrementally in order to effect the immediate use of semantic information. The obvious option in these circumstances is to use a categorial grammar as described, for instance, in Steedman (1985) and Haddock (1988, 1990). However, the NP grammar in chapters 2 and 3 is actually easily implemented in a categorial framework. In fact, some of the rules were written in a categorial grammar in the D-PATR system (Kartunnen 1986) and in most cases there is an obvious translation from the phrase structure rules into a categorial representation. The actual D-PATR grammar rules are not presented here, but there is a detailed discussion of the use of lexical rules in the latter system in chapter 3. It is notable that one important result of the research which was done on PATR is that the use of directed acyclic graphs (DAGs) to represent linguistic information has shown that grammar formalisms such as GPSG, LFG (Kaplan and Bresnan 1982), categorial grammar, and some others, are compatible with each other in many significant ways. I shall assume, therefore, that the choice of a phrase structure rather than a categorial approach does not constitute a significant decision in this context.

In practical terms, the choice of context free phrase structure grammar was largely determined by the architecture of the SIP recognition system in which a development environment exists for phrase structure grammars. Also, to my knowledge there are no existing categorial grammars whose coverage approaches that of the Alvey grammar, and as suggested above, compatibility with this grammar is assumed to be desirable if only because the coverage of

the two grammars together is wider.[2]

One other way in which the practical use of the grammar has affected its form should be noted. A lot of effort has been spent in ensuring that the rules overgenerate as little as possible. This is clearly not just a practical problem; it is often assumed that a grammar should analyse, as nearly as possible 'all and only' the sentences of the language in question. However, for applications such as speech recognition, this factor becomes crucial as syntactic knowledge sources are typically used as a method of prediction. Thus a standard flow of control in recognisers assumes that lexical access components will ask a syntax component the question "which words can appear next?". The more the grammar overgenerates, the more words will be hypothesised and the worse the recognition accuracy will be. Some care has therefore been taken to eradicate certain kinds of overgeneration which are allowed by the Alvey grammar and by the other analyses of NP structure which are discussed in chapters 1, 2 and 3. It is also worthwhile noting that the grammar is intended to be as far as possible a domain-independent account of NP structure, and this too has determined the content to some extent.

Finally, it must be accepted that the attention to detail in chapters 2 and 3 occasionally results in myopia. One example of this is provided by the sense in which 'case-marking' is used. The term is employed in a very particular manner which is only really viable within the strict confines of the SIP grammar; looking at further data, even simple data such as the manifestation of case in pronouns, would necessitate a change in the formal account. However, I have assumed that the required changes could be stated fairly easily and that there was no need to complicate the exposition of the basic arguments.

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[2] The Alvey grammar covers a vastly wider range of constructions than the SIP grammar which is presented here, and I do not wish to give the impression that the analyses are comparable in this sense. However, the SIP NP grammar does extend the coverage of the Alvey system in some important respects.

0.2. Overview

There are five main chapters in the thesis. Chapter 1 contains a review of some existing approaches to NP syntax which serves both to introduce the data and to outline the main areas of argument surrounding the question of NP structure. The relevant data are often, of course, determined by the particular analysis which is being assumed, and so it is not possible to set out the entire corpus of material from the beginning. However, most of the relevant constructions are discussed in Jespersen (1914) and Quirk et al. (1972). The question of NP structure is introduced with extensive reference to the work of Stockwell et al. (1973), Jackendoff (1977), and Selkirk (1977).

Chapter 2 describes the SIP development environment in some detail in order to provide the background for the actual analysis. There is a discussion of some data from Old English which have shaped the analysis of partitives which follows, and a number of issues which arise from this analysis are then investigated. Notably, the use of lexical rules is discussed and there are sections on the question of what case-marking means in the developing account.

Chapter 3 extends the analysis to include NPs which contain more than one specifier and also to supply an account of pseudopartitives. These extensions necessitate a revision of some of the lexical entries which were provided in chapter 2. A brief summary of the complete grammar is then provided and the analysis is compared with the Alvey grammar (Grover et al. 1989).

Chapter 4 introduces the question of NP semantics by reviewing some important work, notably Barwise and Cooper (1981). The central theme of the chapter is the question of the characterisation of definiteness, and the work of Ladusaw (1982), Löbner (1986) and Kamp (1981) is also reviewed.

Chapter 5 looks at further semantic issues, mainly the topic of plurality, and

introduces the work of Link (1983, 1986a, 1986b) and van Eijck (1986). Semantic operations are then proposed for the syntactic rules in chapters 2 and 3. Finally, chapter 6 draws some conclusions and suggests further areas for research.

There are two appendices. Appendix A provides a full listing of the grammar in chapters 2 and 3 along with a lexicon containing most of the important items discussed in the text. Without the surrounding text, the grammar and lexicon are in a computer usable form. A brief example parsing session is provided using the grammar and a listing of test data is also given, divided into strings that are accepted and those which are rejected by the grammar. Appendix B contains a list of sentences which were used to test some important grammaticality judgements. No results are given in the appendix as these are discussed at the relevant points in the main text.

Chapter 1

A History of Partitives

1.1. Introduction

This chapter introduces the basic data and reviews some seminal accounts of NP structure. Jespersen (1914) and Quirk et al. (1972) are used to supply some general background and also to indicate where and why I have been selective in choosing the data which will concern us. The proposals in Jackendoff (1977) and Selkirk (1977) have had a great deal of influence on research in the structure of NPs and these are investigated in some depth below. Some of the formal issues which predate the latter two accounts are introduced by reviewing Stockwell (1973).

1.1.1. Terminology and Preliminary Data

It is useful to say a little about terminology. I shall begin by using 'specifier' to refer to any item which combines with nouns to produce noun phrases. These are broadly sub-classified below. The main classes which are proposed are demonstratives (*the, this, that, these, those*) and quantifiers (all the specifiers listed below minus the demonstratives). For the moment, I shall use 'specifier' as a covering term, and note that, particularly when other authors are being quoted, 'quantifier' is occasionally used for the whole class. Nouns are assumed to be classified as singular count (e.g. *book*), plural count (*books*), or mass (*wine*); further sub-classes are described where necessary. I shall attempt to characterise the central aspects of the syntactic properties of the following specifiers:

each, every, any, some, much, either, neither, little, a little, many, few, a few, several, all, a, no, none, the, this, that, these, those, both, half.

Certain classes of collective nouns which appear to have a quantifying feature are included, typical examples being:

group, bunch, collection, herd, team, family.

The numerals are also discussed, as is a largish number of items whose classification is not so straightforward, but whose relationship to the other classes is strong. Instances are:

a lot, a number, a gallon, a dozen, a piece, a slice.

For the moment, WH pronouns and genitive possessives will be included in the latter miscellaneous category. The other main participants in NPs are, unsurprisingly, nouns. I supply a featural analysis of these which accounts for most of the relevant distributions.

It is tempting to use terms like 'and so on', 'for example', and 'etc' when providing classifications such as those above. I have avoided this as much as possible with the quantifiers and demonstratives/articles as I feel that the smallish number of items in these sets merits an exhaustive description. On the other hand, collective nouns, numerals, measure nouns like *gallon*, and the genitive possessives all comprise large sets (infinite in some cases), and are fair game for the occasional 'etc'. Also, where an item is specifically being used as an exemplar for a particular class it is acceptable to refer to the others as 'and so on'.

I shall begin by assuming that NPs fall into two basic categories; simple and partitive. As with most linguistic terms and categories, the definition of these classes is ultimately theory-driven and as a result the data are usually

introduced by adducing stereotypical instances. The present study is no different. The following are simple NPs:

(1-1a) A student
(1-1b) A few problems
(1-1c) A little gin
(1-1d) The thesis
(1-1e) The many mistakes
(1-1f) Much worry

Typically, then, a simple NP contains up to two specifiers and a noun. Of course, many other categories can appear, notably adjectives and adverbs. I have nothing to say about adverbs, and adjectives are only discussed in relation to a particular subset of the specifiers with which they seem to have common features (see chapter 3).

The main emphasis is on providing a reasonable account of partitives. I hope to show that a suitable analysis of these has implications for the account of simple NPs. In contrast to the NPs in (1-1), the following are partitives:

(1-2a) Each of the students
(1-2b) A few of the problems
(1-2c) A little of the gin
(1-2d) Most of the thesis
(1-2e) The many of his mistakes
(1-2f) Much of her worry

As a rule of thumb, therefore, a partitive is a noun phrase which contains up to two specifiers followed by another phrase introduced by *of* which bears at least a passing resemblance to a prepositional phrase. At first sight, (1-2e) is questionable. This kind of example is usually followed by further modification, typically a relative clause, as in:

(1-3) The many of his mistakes which were due to bad luck were excusable

The term 'partitive' is clearly semantic in origin; a partitive has, or at least had,

something to do with the designation of parts of things. Thus Jespersen (p.339) suggests that *The City of London* is a partitive while *The City of Rome* is not. These examples are marginal, as attested by the fact that Quirk et al. (1972) classify *The City of York* as an appositive genitive. I shall not be concerned very much with such data, apart from in the introductory discussions of the work of Jespersen and Quirk et al. I shall concentrate mainly on what seem to be the accepted problem areas for modern linguistics and semantics, investigating further data as suggested by the developing analysis.

1.1.2. Formal Assumptions

Some of these assumptions were justified in the general introduction to the thesis. To review the main points; I will propose a context free phrase structure grammar account of the data, and the rules which are developed in chapters 2 and 3 are firmly based on Generalised Phrase Structure Grammar as described in Gazdar et al. (1985). It is assumed that an account in this framework is to be preferred over a more powerful grammar formalism such as transformational grammar. The analyses of Stockwell et al. (1973), Jackendoff (1977), and Selkirk (1977) which are discussed below rely to various extents on transformations; given my commitment to context free grammars, no argumentation is given to refute the formal proposals if transformations are involved.

Another formal assumption which clashes with the transformational accounts cited above concerns the relationship between syntax and semantics. There is no direct mapping between syntax and semantics in the work of Stockwell et al., Jackendoff, or Selkirk which is cited above; in fact, the authors often explicitly argue on occasion for the autonomy of syntax as a theoretical position. I am assuming that the relationship should be as close as possible in the tradition of

GPSG as outlined in the introduction to this thesis.

1.2. Partitives

The following sections introduce more data concerning partitives and outline the important points for later discussion. As mentioned above, this is done mostly by working through earlier accounts. The arrangement is almost historical, beginning with Jespersen (1914) and Quirk et al. (1972) and proceeding via the transformational accounts of Stockwell et al. (1973), Jackendoff (1977), and Selkirk (1977). The last two are an exception to the chronological order in that they are to all intents and purposes contemporary; each author alludes to the other's research. The work of a few other authors is mentioned at appropriate places.

1.2.1. Jespersen

Much of the data which is relevant to this subject can be found in Jespersen (1914). However, as suggested by the *City of London* example above, it is probably the case that most of his data are peripheral, and he does not actually cite what are now the accepted central constructions such as those in (1-2) above. Jespersen introduces the partitive in a long discussion of uses of *of*, and some of his initial examples are (p.333):

(1-4a) One of his daughters
(1-4b) The rest of the party
(1-4c) The best of men
(1-4d) One part of the soldiers
(1-4e) The beginning of the story
(1-4f) At the bottom of the page
(1-4g) First of all

Only the first of these is clearly related to the examples in (1-2). All of them, certainly, designate a part of something, but my previous rule of thumb

suggested that the first word should be a specifier. The numerals are more obviously related to specifiers than expressions like *the rest* or *the bottom*. There are reasons to exclude such data from the present investigation while accepting that they are at least close relatives of partitives. If the true definition of a partitive is semantic in the sense that a sub-part of something is denoted, then there are clearly quite a few ways in which the sub-part can be distinguished, as the examples in (1-4) show. However, it should be possible to make a distinctions between 'pure' sub-part relations and those which rely on some independent semantic feature of the sub-part.

I could happily substitute 'subset' for 'sub-part' above, and in most of this thesis. However, it is also worth pointing out from the start that, as shown by NPs like *a little of the gin* (1-2c), the semantic relationships are more general than simple subset denotation. To jump ahead a little, it will be argued that lattice theory provides a reasonable account of these more general relationships. Thus where in the last paragraph I referred to 'pure sub-part relations', I will argue that this can be translated into lattice ordering (chapter 5). It is therefore the case that the partitives which will concern us are mostly those in which sub-parts are distinguished purely by this ordering. Having noted the distinction between 'subset' and 'sub-part', I shall now feel free to use these terms as the occasion demands. For the sake of immediate clarity, 'subset' is usually adequate. Looking again at the data, in examples like *the best of men* (1-4c), the subset is being selected on grounds other than just the fact that it is a subset and the NP is therefore a peripheral case. Thus *the best of the men* can be contrasted with *one of the men*; both NPs serve to pick out a single person from the set in question but the former does this on independent semantic grounds. Unfortunately, of course, there are many examples which are not so clearly classifiable, and so the latter discussion really serves to supply another rule of thumb. For instance, how does one categorise *enough of the water* or *plenty of*

my friends?

Jespersen also gives examples of partitives formed using fractions (p.334):

(1-5a) One half or two thirds of the population
(1-5b) One fourth of their value
(1-5c) A quarter of an hour

He notes that some of these have forms which omit the *of* and alludes to some contemporary disagreement over whether or not *a fourth their value* (cf. (1-5b)) is allowable. It seems probable that analogous disagreements would exist today. NPs like *half the world*, on the other hand, were and are uncontroversial. It is interesting to note that Jespersen classifies the uses of the fractions without *of* as adjectival, while the forms with the preposition are substantival. Hence *one half the world* is a hybrid (p.334). Similar arguments are adduced in the case of *plenty*, although the adjectival use is extremely restricted in the range of modifiers which can be added. In fact, none are particularly convincing.

Another interesting class of partitives which Jespersen discusses contain what he calls "quantitative" or "numeral" words, as in (p.335):

(1-6a) A bottle of rum
(1-6b) Lots of people
(1-6c) A distance of two miles
(1-6d) A reward of ten pounds
(1-6e) A couple of days
(1-6f) A pair of stockings

This introduces a class of constructions which are discussed extensively by Selkirk. One apparent difference from the previous examples is that the phrase after *of* does not contain the definite article which is prevalent in the NPs in (1-2), (1-4) and (1-5). The (1-6) NPs do not, of course, necessarily omit the article; *a bottle of the rum* and *lots of the people* are perfectly acceptable, although some of the other NPs are at best awkward in this form. Thus *a distance of the two*

miles and *a reward of the ten pounds* are rather strange. Making the whole NP definite helps, however. Some of these facts will be discussed in depth in the review of Selkirk's work which follows (section 1.2.5.). For the moment, it will suffice to note that the NPs in (1-6) would, on structural grounds, be called pseudopartitives by Selkirk. Jespersen, on the other hand, classifies the constructions mainly in terms of the specifiers, which can be seen by the fact that not all the (1-2) (1-4) and (1-5) NPs contain definite articles in the prepositional phrase. As before, the characteristics of the specifier are significant in determining how the subset is picked out. Once again, I shall assume that the best instances are those in which the relationship is as near as possible to simple subset, as in *lots of people*.

Jespersen emphasises the semantic/pragmatic nature of his characterisation of partitives by noting that "in cases when the two words connected by *of* are coextensive ..... the term partitive is not applicable" (p.338). Thus *all of your clothes* is not a partitive but an appositional use of *of*. Unfortunately Jespersen does not include a discussion of *every* or *each* at this point, so it is not clear how he would classify these. However, *both* and *either* are included, as are cases with a definite numeral such as *the three of us*. This, then, explains the distinction which he draws between *The City of Rome* and *The City of London*. The first is appositional and the second partitive if the semantic definition of a partitive insists that the sub-part must be a proper sub-part. In present-day linguistics it is usually assumed that *all of the boys* is actually a partitive and I shall accept it as such.

Quite a few other facts are discussed by Jespersen in his section on partitives. Some are interesting; for example, the formation of partitives with headless relatives such as *half of what you owe* and without a specifier in sentences like *he gave us of his best* (p.333). However, the last example probably falls into the

archaic/formal category and many other constructions cited by Jespersen are similar. I have therefore largely ignored this data and, as I suggested in section 1.1., the emphasis will mostly be on outlining the problems posed by NPs such as those in (1-2).

1.2.2. Quirk, Greenbaum, Leech, and Svartvik

Before going on to look at the question of what the structure of partitives should be, it is interesting to note that the classes of partitives which Jespersen proposes are sub-classified further in Quirk et al. (1972). They suggest that three types of partitive are used to express quantities of mass nouns. These are *measure, typical,* and *general* partitives. Examples are (p.131-133):

Measure Partitives:

(1-7a) A yard of cloth
(1-7b) A mile of cable
(1-7c) An acre of land
(1-7d) A pint of beer
(1-7e) A gallon of petrol
(1-7f) A pound of butter

Typical Partitives (with concrete mass nouns):

(1-8a) A suit of armour
(1-8b) A slice of bacon
(1-8c) A loaf of bread
(1-8d) A stick of chalk
(1-8e) A bar of chocolate
(1-8f) A lump of coal

Typical Partitives (with abstract mass nouns):

(1-9a) A word of abuse
(1-9b) A word of advice
(1-9c) A bit of business
(1-9d) An attack of fever
(1-9e) A fit of passion
(1-9f) A piece of research

General Partitives:

(1-10a) A piece of chalk
(1-10b) A piece of advice
(1-10c) A bit of grass
(1-10d) A bit of trouble
(1-10e) An item of information
(1-10f) An item of news

The reasons for these classes are semantic, and probably not always applicable; it is not obvious, for instance, why *a bit of business* is a typical partitive while *a bit of trouble* is general. However, Quirk et al. say that the measure partitives relate to "precise quantities" (p.131) while in the case of the typical partitives, as the name suggests, there is usually only one word which can appear in the specifier position depending on the noun in the *of* phrase. (Quirk et al. use 'partitive' to refer to the quantifying nouns themselves rather than the whole NP.) The general partitives are not restricted to specific lexical items, as shown.

As with Jespersen (1914), most of the data are unfortunately peripheral. My argument about the purity of the sub-class relationship certainly applies as constructions like *a suit of armour* are hardly compatible with *some of the armour* in this respect. Notice that *a suit of the armour* is quite strange, which shows that the quantificational nature of *suit* is rather questionable. Finally, as will shortly be explained, all the examples in (1-7), (1-8), (1-9), and (1-10) which are partitives in the sense that they exhibit fairly straightforward sub-part denotation fall into Selkirk's pseudopartitive category.

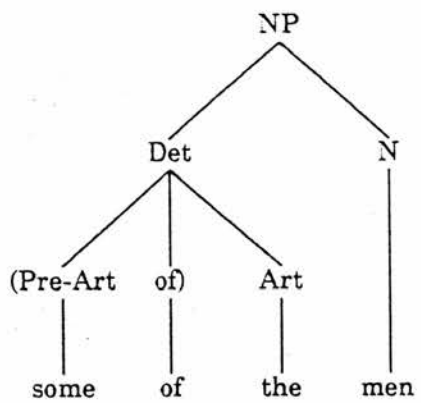
1.2.3. Stockwell, Shachter, and Partee

The account of NP structure in Stockwell et al. (1973) is one of the most extensive to be found. Many of the arguments are based on earlier proposals which are attributed to Chomsky (1965) and to unpublished work by Dean, Hall,

and Jackendoff. The important question is what the structure of partitives should be. The data are more or less taken for granted and consist mostly of examples such as those in (1-2). (In fact, nearly every partitive which is discussed in the rest of this chapter will contain a standard specifier and a plural noun in the *of* phrase.)

The general background to Stockwell et al.'s analysis is provided by Chomsky (1965) in which one concern was the source of specifiers in NP structure. Partitives supply a lot of the data, and this area therefore provides a good introduction to the relevant arguments. In an unpublished paper, Hall had proposed the structure below (Hall 1963):

(1-11)



The original rule is actually **Det → (Pre-Article^of) Article** where '^' is the string concatenation symbol; an alternative representation would be to introduce an optional sub-constituent. The effect is the same; if the pre-article appears it must be followed by *of*. Some of the arguments advanced by Stockwell et al. on the structure of partitives are aimed at the question of whether or not surface structure directly reflects deep structure. As I suggested above, I shall be regarding such questions as irrelevant. However, there are other criticisms to be made of the analysis in (1-11). Stockwell et al. point out that *of the men* is not considered to be a constituent, and this has a number of

undesirable results which they do not detail but which are worth introducing here. Before looking at the relevant data, I should note that I have been presupposing the answer to this question by calling the words which follow the specifiers an *of* phrase. I shall now attempt to justify this.

The traditional arguments about constituent structure are usually based on coordination, ellipsis, interpolation, and movement.[1] Taking these in turn, the data below are relevant.

Coordination:

(1-12a) ? Many of the boys and of the girls
(1-12b) ? Many of the boys and the girls
(1-12c) Many of the boys and girls
(1-12d) * Many of and some of the students

Coordination needs to be treated with caution, but it does seem that the only truly felicitous NP is (1-12c). It is not clear that the others are possible and (1-12d) is certainly the worst. In order to support the suggestion that *of NP* is a constituent, (1-12a) would have to be acceptable. Note that this sort of coordination is not particularly good with other prepositions either:

(1-13a) ? A book about the boys and about the girls
(1-13b) ? A tape machine for playing and for recording

If the second conjunct is understood as an afterthought, then (1-12a) seems just as acceptable. There is also the hint of the sort of incantation beloved of politicians and occasionally found in prayers; the end of the Lord's Prayer being an example with non-partitive *of*. It may be that there is a pragmatic restriction on such conjunction if neither of the latter interpretations are possible. In any case, the partitive *of* phrases appear to be patterning with

[1] Throughout this thesis I shall use 'movement' to refer to various permutations of what is assumed to be an underlying unmarked sequence. It should be noted, however, that I am using the term metaphorically; unless transformational grammar is explicitly being discussed, the items concerned are not really 'moved' although they are related to the unmarked position. The use of GPSG slash categories is one way of specifying this relationship (Gazdar et al. 1985).

prepositional phrases in all these respects and it seems that the only clear evidence for constituent-hood is provided by examples such as (1-12c); thus, rather uncontroversially, *boys* and *girls* are constituents.

Ellipsis:

(1-14a) He saw many of the boys and I saw some Ø
(1-14b) * He saw many of the boys and I saw some of Ø
(1-14c) * He saw many of the boys and I saw some of the Ø

On the assumption that only syntactic constituents can be elided, this suggests an *of* phrase. Again, this seems to parallel the situation with other prepositions:

(1-15a) I walked to the door and he ran Ø
(1-15b) * I walked to the door and he ran to Ø
(1-15c) * I walked to the door and he ran to the Ø

Interpolation:

(1-16a) ? She ate some quickly of the cake
(1-16b) * She ate some of quickly the cake
(1-16c) * She ate some of the quickly cake

Adverbials can usually appear between major constituents, as in *she quickly ate the cake.* Inside NP this is highly restricted, as these examples show. The only possible interruption of the partitive appears in examples like (1-16a). These are normally understood to be parenthetical, as in:

(1-17) Some, certainly, of the Government's views ....

Again, on the assumption that interpolation is easiest between major constituents, this provides some evidence that *of NP* forms a phrase.

Movement:

(1-18a) Not much has been eaten of the leftover turkey
(1-18b) * Not much of the has been eaten leftover turkey
(1-18c) Of the students, a few were Scottish
(1-18d) * Students, a few of the were Scottish
(1-18e) * The students, a few of were Scottish

If movement is restricted to syntactic constituents, this clearly suggests that *of the students* and *of the leftover turkey* are constituents. There is evidence that dislocations like (1-18e) may be possible in some contexts, for example; *?which biscuits did you eat all of?*. These do not of course provide counter-examples; the implication is just that *the students* is a sub-constituent of *of the students*.

Generally then, the evidence is that *of* forms a syntactic constituent with the following NP, and not with the preceding specifier. The internal structure of the *of NP* is not so clear.[2] Nevertheless, with reference to the suggested analysis in (1-11), the data from conjunction, ellipsis, interpolation and movement clearly contradict the proposal that *some of the* is a constituent. Further issues concerning the relationship between the partitive phrase and PPs are discussed in chapter 2.

Stockwell et al. have another objection to (1-11) which is that number agreement is complicated due to the fact that "in some constructions agreement is with the head noun while in others agreement is with either the pre-article or the head noun" (p.113). In (1-11) it is obvious that 'head noun' is used by Stockwell et al. to refer to the only noun present in the structure. Specifying the head is clearly more complicated when there are two nouns, for example in Jespersen's (1914) measure phrase partitives like *a bunch of daffodils*. The use of transformations can also introduce complications in that, for example, some analyses have empty nominal positions in these constructions. However, the

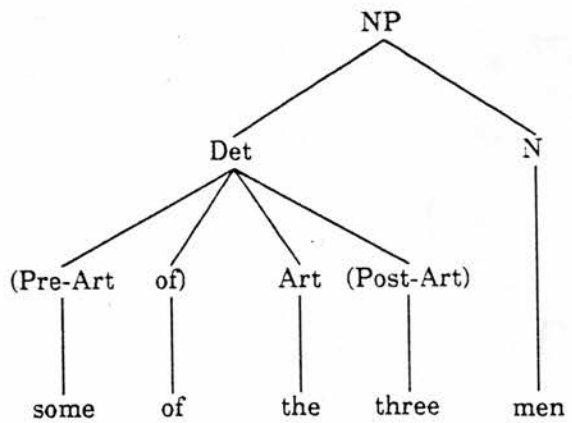
[2] I shall often refer below to this structure as the 'partitive phrase' as this seems to be the standard term.

relevant number agreement data provided by Stockwell et al. are (p.113):

(1-19a) All of the men shot themselves/*himself in the foot
(1-19b) Each of the men shot ?themselves/himself in the foot

It is not clear how this could be simply handled given (1-11). Also, there are some NPs which cannot be analysed in this structure, such as *the three men* and *each one of the boys*. As a result of some of these arguments, the following structure is proposed in Chomsky (1965, p.107):

(1-20)



The problem with the constituenthood of *some of the three* remains, but some of the recalcitrant NPs can be analysed and, as Stockwell et al. point out, there is the added advantage that pre-article specifiers are now distinguished from post-article specifiers. They suggest that the former include *all, some, any, each, every,* and *either*, none of which can occur as post-articles. However, *each one of the boys* is still a problem, and Stockwell et al. further argue that, as some specifiers appear in both positions, constructions such as *many men* and *several women* would have multiple syntactic analyses while being semantically unambiguous. Recursive uses of specifiers such as *each of the first three of the boys* (p.112) also pose problems. It seems clear, then, that an analysis in which *of NP* is a constituent is to be preferred.

Stockwell et al. introduce their own analysis by arguing that there is deletion of

a noun after the specifier. Thus (1-21b) underlies (1-21a) (p.114):

(1-21a) Two of the cooks
(1-21b) Two cooks of the cooks

A number of arguments are advanced in favour of this. However, as I suggested above, the whole analysis depends heavily on the use of transformations, and I shall not attempt to refute each argument explicitly. It will partly suffice to note that the approach often relies on the assumption that a gap site must have been filled at some stage in the derivation by the actual lexical item. It then remains to prove that there really is such a site following the specifier, and it is these latter arguments which are particularly suspect and worth criticising.

To begin with a general point, there is a clear reason for suggesting an underlying noun position immediately after the specifier; the grammar is unhelpfully complicated if specifiers can appear with both nouns and prepositional phrases. The assumption of an underlying noun allows a general statement of specifier distribution. I will argue later that this problem can be quite easily overcome (chapter 3) and ignore the question at present.

Stockwell et al. suggest that cases where the specifier requires *one*, as in *every one of the boys*, are intermediate stages in the deletion of the noun which are only explicable if it is assumed that the noun is present somewhere. If the latter point is refuted, then the behaviour of these specifiers is merely consistent with other 'null-head' instances. For example, the following correspondences are notable:

(1-22a) Some of the boys
(1-22b) We ate some
(1-22c) * Every of the boys
(1-22d) * We ate every
(1-22e) Every one of the boys
(1-22f) We ate every one

The appearance of *one* therefore has no particular significance in partitives. It is possible that in the latter argument Stockwell et al. are on the verge of conflating transformational accounts, which derive surface forms from underlying representations, with diachronic change. This questionable claim is perhaps more explicitly made in a later argument in which they propose that:

> Apparently some quantifiers also reflect the prior presence of a noun (or pronoun) which merged with it. (p.115)

The anaphora in this quote is interesting as there does appear actually to be only one case; *none*. The question, as far as the relationship between transformations and diachronic change is concerned, is when the merging is seen to have taken place. It is the case that the transformations finally proposed by Stockwell et al. have *one(s)* at one point in the derivation of partitives. It is not clear whether they mean the merging to be a morphological derivational process or a historical change which results in suppletion. Either way there are problems. The examples they give are (p.115):

(1-23a) None of the books
(1-23b) * None books
(1-23c) * No of the books
(1-23d) No books

The suggestion is therefore that the prior presence of *one* is shown here, and that *no one* has become *none*. If Stockwell et al. are thinking in historical terms, they are probably wrong; *none* seems to be descended from two Old English sources (*pace* Collins English Dictionary). These are *nǣnig* which in turn evolved from *ne ǣnig* (not any), and *nān* which came from *ne ān* (not a/one). The modern form appears to be a fusion of these and still contains the former sense, which is clear from its use with mass terms as in *none of the water*. It is difficult to sustain the notion of an underlying *one* in these latter cases whether the prior existence is historical or morpho-syntactic. Note also

that there are words which are clearly the result of specifiers 'fusing' with *one*, as in *everyone* and *someone*, and that these cannot appear in partitives:

(1-24a) * Everyone of the men
(1-24b) * Someone of the women

Stockwell et al. have thus been highly selective in their choice of data here; on at least one interpretation of 'underlying', the most obvious examples of underlying *one* are problematic. Another construction which they adduce as evidence is attributed to an unpublished paper by Dean (Stockwell et al. 1973, p.115):

(1-25a) Only four paintings of those which had been stolen were recovered
(1-25b) Only one trout of the fish we caught was large enough to be worth cooking

However, it is not clear that the existence of such examples proves the correctness of the underlying noun hypothesis. That they are related semantically to partitives is clear, particularly in the case of (1-25a), although the precise nature of the relationship is not obvious and a formal statement of it would be problematic. Stockwell et al.'s deletion analysis would require to be optional, and the statement of what conditions the optionality would be tricky. For example, unconstrained application of the rules which allow (1-25a) would also produce:

(1-26a) Many of the sandwiches which we ate were disgusting
(1-26b) ?* Many sandwiches of those which we ate were disgusting
(1-26c) Some of the students who were present objected
(1-26d) ?* Some students of those who were present objected

One counter-argument to the underlying noun hypothesis which is noted by Stockwell et al. is attributed to unpublished work by Postal. The contention is that partitive NPs like *many of the boys* are definite, but in Stockwell et al.'s account the head noun is indefinite and so the whole NP is indefinite. The test

for definiteness is supplied by putting the NPs in sentences such as (p.118):

(1-27a) There were many boys at the party
(1-27b) * There were many of the boys at the party
(1-27c) Big as many of the boys were, they couldn't lift it
(1-27d) * Big as many boys were, they couldn't lift it
(1-27e) Many of the books are John's
(1-27f) * Many books are John's

Although a correct treatment of definiteness would seem to be fairly crucial, Stockwell et al. argue that these constructions are peripheral and do not provide strong evidence that their account, which relies on fundamental grammar rules, is wrong. Again, there is no real need to go further into such questions as these fundamental rules rely on transformations; for the same reason there is no need to investigate the final analysis of partitives which Stockwell et al. provide. Note that there is further discussion of their analysis in chapter 3 when the multiple specifier cases such as *the many women* and *the few of the men* are examined in detail. The above discussion has served, though, to highlight important questions about partitive structure. For the moment, the only conclusions which I have drawn are that the words following the specifier(s) form a constituent and that the notion of an underlying noun immediately following the last specifier is problematic.

1.2.4. Jackendoff

Jackendoff (1977) contains another large-scale account of NP syntax. This analysis is developed within the framework of X-bar theory. As I mentioned previously, he uses transformations sparingly and it is usually easy to see how the ones which are used could be translated into a context-free formalism. I shall therefore spend some time on the details of his formal approach, which begins with an account of simple NPs.

1.2.4.1. Simple Noun Phrases

Jackendoff assumes three semantic roles for NP specifiers: Demonstratives, Quantifiers, and Numerals. His examples of these classes are:

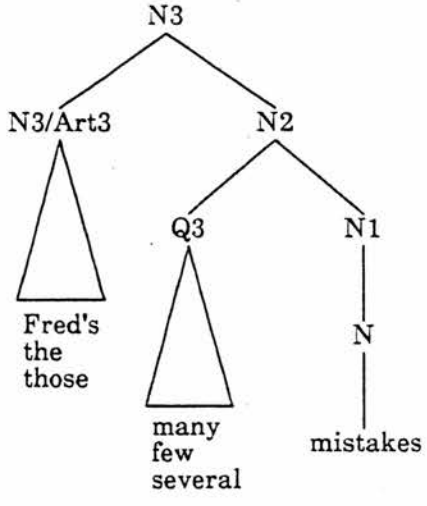
Demonstratives: *the, this, that, these, those, which, what, (a,* singular *some)*
Quantifiers: *each, every, any, all, no, many, few, much, little, some*
Numerals: the cardinals, plus *a dozen, a couple, a few, a little*

Jackendoff suggests that these classifications are made "intuitively" and that they may be corroborated by evidence "yet to be found" (p.103). Combinations of specifiers are restricted by the 'specifier constraint' (p.104) which states that:

(1-28) An NP specifier may contain at most one demonstrative, one quantifier, and one numeral.

The phrase structure rules are quite complicated. This is at least partly due to the assumption that the major syntactic classes appear in parallel structures, and hence the structural configurations of nominal projections are the same as those of verbal projections, and so on. However, the basic tree looks like (1-29) below (p.105):

(1-29)



There are therefore two specifier positions into which the three semantic classes of specifier can go (sisters of N are all strictly subcategorised arguments). The

specifiers are sub-classified syntactically also, into Arts and Quantifiers. The Arts include *some, each, all, no,* and *any,* while *many, few,* and *several* are Quantifiers. The numerals are syntactically Quantifiers. Thus the following NPs are allowed (cf. p.104):

(1-30)	Fred's the those which	many few several	mistakes

Jackendoff points out that it would still be possible to generate NPs like those in (1-31) below (cf. p.105):

(1-31)	*	some each all	many few several	mistakes

However, these will be ruled out semantically by the specifier constraint above. At this point, it is interesting to look at further data and attempt to classify all the items in section 1.1. above in Jackendoff's terms. The following distributions seem to be suggested:

Arts: *each, every, any, some, either, neither, all, a, no, none,* plus
demonstratives and genitives
Quants: *much, little, many, few, several,* numerals

It is not clear how *both* and *half* are to be included; I assume they are most likely to be classified as Arts. Given Jackendoff's suggestion that *a few* and *a little* are numerals, it seems probable that *a number* is too. This means that the following NPs will be generated from the list of specifiers given in the introduction to this chapter:

(1-32)			
	each		
	every		
	any		
	some	much	
	either	little	
	neither	a little	
	all	many	
	a	few	mistakes/wisdom
	no	a few	
	none	several	
	the *(etc)*	three *(etc)*	
	John's *(etc)*	a number	
	both		
	half		

These classifications account for a fair number of the possible collocations while allowing a good deal of over-generation. Jackendoff points out that *the much*, *every much*, and so on are ill-formed, and notes that further research is necessary (p.105). However, he does also allow *a many* and *a several* as well as *a much*. Also, the classification of *a few* and *a little* as numerals predicts NPs such as **a a few, *the a little, *some a number*. These latter cases are particularly obvious ill-formed NPs, but Jackendoff offers no argumentation in support of the classification apart from intuition; example specifiers from the proposed classes are simply listed (p.104). Assuming that *half* and *all* are syntactically articles means that *both two men* will be generated, but also that **half four mistakes* is well-formed according to the grammar.

1.2.4.2. Jackendoff's Partitive Structure

In introducing his account of partitives, Jackendoff uses group noun partitives such as *a bunch of the daffodils* to illustrate the general properties. These seem to correspond to Jespersen's (1914) quantitative or numeral partitives and Quirk et al.'s general partitives (section 1.2.1. and section 1.2.2.). He notes that *of the N2* in these structures behaves like the ordinary object of the NP in that it

always precedes N2 modifiers, and adduces the following data (p.107):

(1-33a) A gallon of the wine | in the kitchen / from Sicily |

(1-33b) * A gallon | in the kitchen / from Sicily | of the wine

The reasoning here is partly based on Jackendoff's assumption that the major syntactic categories have parallel structures. Thus one can speak of 'object of NP' in the same way as 'object of S' or 'object of VP'. The examples in (1-33) show that, as in VPs, the object typically immediately follows the head of the phrase and precedes N2 modifiers, as would be expected of such complements. (The proposed tree structure for these partitives is given in (1-39) below.) The latter argument assumes, of course, that *gallon* is the head of (1-33a) and (1-33b), and as I noted previously (section 1.2.3.), Stockwell et al. assume that the lower noun is the head in at least some constructions. This question is raised again in section 1.2.5.9. below. For the moment, (1-33a) and (1-33b) are interpreted by Jackendoff as support for his assumption that the partitive phrase forms a constituent. He explicitly contrasts his approach with Chomsky's proposal (as in (1-20) above), and as further evidence, the behaviour of the pronoun *ones* is cited (p.107):

(1-34a) Groups of the men from Siberia and ones from Japan
(1-34b) * Groups of the men and ones of the women

In (1-34a) *ones from Japan* is to be interpreted as *groups of the men from Japan.* The pronoun does not seem to able to substitute for the head alone, and this would be expected if *of the men* is a complement of *groups* in these cases. I assume here that Jackendoff is taking *one(s)* to be a pro-N1 and suggesting a parallelism between examples such as those in (1-34) and others like:

(1-35a) The teachers from Russia and the ones from Spain
(1-35b) * Teachers from Russia and ones from Spain
(1-35c) The teachers of English from Russia and the ones from Spain
(1-35d) * Teachers of English from Russia and ones from Spain

In (1-35c) *ones* cannot mean *teachers*; as in (1-34a) it must refer to the noun and the N1 complement together, which in this case is *teachers of English*. The argument that *of English* is an N1 complement rests on data such as:

(1-36a) Teachers of English from Russia
(1-36b) * Teachers from Russia of English

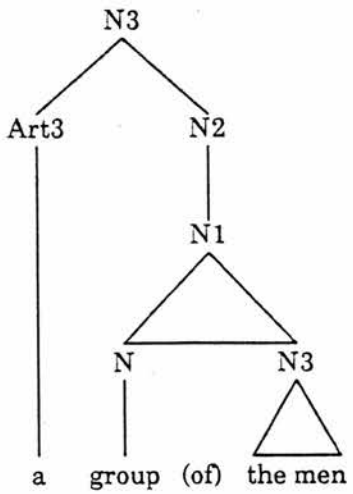
Assuming that *of Russia* is an N2 complement while *of English* is an N1 complement explains the data in (1-36) as, given a structure such as (1-29) above, *from Russia* cannot appear in the position it occupies in (1-36b) without crossing dependencies. Generally, therefore, the behaviour of the pro-form can be generalised if the structure of *a group of the men* is similar to *the teacher of English* which means in turn that the partitive phrase forms a constituent. Jackendoff also refers to Selkirk (1977) in which the evidence of extraposition is adduced to show that *of the N2* is a constituent. Some of the data have already been mentioned in section 1.2.3. where movement was discussed as evidence for constituent structure:

(1-37a) A lot of leftover turkey has been eaten
(1-37b) A lot has been eaten of leftover turkey

(1-38a) Only a handful of those questions concerning electromagnetism were asked
(1-38b) Only a handful were asked of those questions concerning electromagnetism

Following these arguments, Jackendoff proposes the following structure for partitive NPs:

(1-39)



Note that in (1-39), as in similar examples below, *of* must be inserted by a transformation. It is not present in the actual structures given, as indicated by the brackets. Jackendoff now has to show that the arguments based of the head-hood of the group noun in these structures can be adapted to partitives formed using specifiers. He does this by suggesting three properties which these two sub-classes of partitive have in common (pp.108-109):

1. Both prohibit quantification in the *of* phrase:

(1-40) * | a group
a number
many
few | of | some men
all men |

2. If the group noun or quantifier is preceded by *the* and has a definite *of* phrase, a restrictive relative clause is necessary:

(1-41a) * The group of the men
(1-41b) * The many of the men
(1-41c) The group of the men that you met
(1-41d) The many of the men that you met

Jackendoff argues that the relative clause here is not attached to the *of* phrase and adduces the following data:

(1-42a) * Of the men that you met, | the group / the many | aren't here any more

(1-42b) Of the men, | the group / the many | that you met aren't here any more

3. Both allow extraposition of the *of NP*:

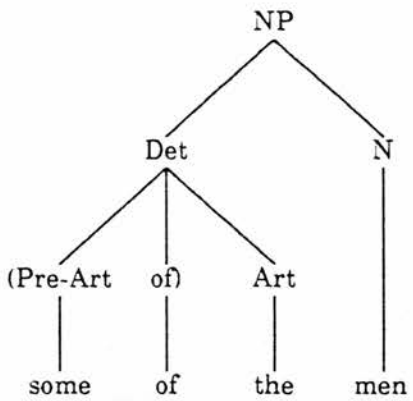
(1-43a) Not much has been eaten of the leftover turkey
(1-43b) Only a few were asked of those questions concerning electromagnetism
(1-43c) He gave several to Mary of his books by famous authors

It is worth pointing out again that the judgements in all these cases are the original author's. I consider (1-43b) and (1-43c) to be more or less ungrammatical; note that there is discussion of grammaticality judgements below when Selkirk's data are being assessed. However, Jackendoff's interpretation of the evidence is that the data in (1-41) suggest that specifiers can take relative clauses, and this in turn means that Preart must be some kind of NP in (1-11) (which is reproduced below for reference). However, Jackendoff argues firstly that "a relative clause on the prearticle should precede the noun rather than follow it" (p.109), so that the underlying structure of, for instance, (1-41c) should be *the group that you met of the men.* A transformation must therefore apply to derive the surface structure. Secondly, the examples in (1-42) show that the rule which derives (1-42b) must extract the head of the phrase and leave modifiers behind, and this Jackendoff calls "an otherwise unprecedented operation" (p.109). Finally, the data in (1-43) show that extraposition would have to move a construction which is not a constituent instead of a PP in the N1 complement.

Where Jackendoff's grammaticality judgements are uncontroversial, these data support the traditional arguments for constituent-hood in section 1.2.3. in providing evidence that the structure in (1-39) is to be preferred to (1-11), in

which *of the men* is not a constituent:

(1-11)

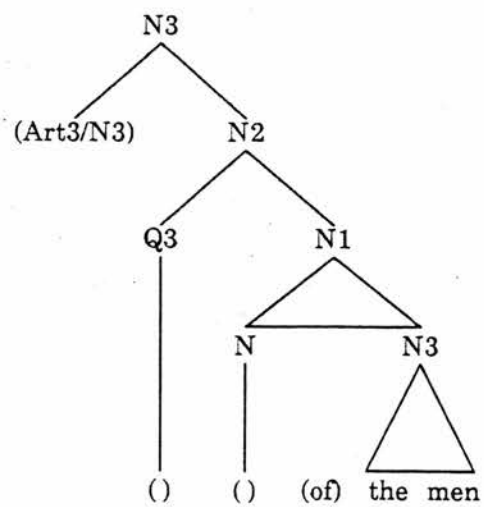


Another problem with (1-11), as Jackendoff points out, is that Preart must have nominal properties, unlike most specifiers, in that it can take relative clauses. Jackendoff's conclusion is that the partitive phrase should be seen as a complement of N, as shown in (1-39).

1.2.4.3. Quantifier Partitives

Jackendoff still has the problem of deciding where to position the specifier in non-group-noun partitives. Given a basic structure like (1-39), reproduced as (1-44) below, he has two main options:

(1-44)



The specifier could appear under Q3 or N, and the latter suggestion appeared in an earlier version (Jackendoff 1968). However, as Jackendoff notes, if the specifier is introduced under N, then there is no simple explanation for the lack of preceding adjectives, which the phrase structure rules would allow:

(1-45a) * Red some of the students
(1-45b) * Large many of the tutors

The specifier is therefore dominated by Q3, and N is left as an empty node expanding as PRO. The Partitive Projection Rule is then required to interpret PRO in this position. This is stated as (p.110):

(1-46) $PRO_N \rightarrow$ UNIT / , [+partitive] __

It is a general rule of Jackendoff's grammar that PRO must be interpreted. The projection rule in (1-46) states that the empty category is to be interpreted in the sense of an abstract 'unit' when it immediately follows certain articles, quantifiers, and adjectives. These are marked [+partitive] in the lexicon. It is not clear from Jackendoff's discussion what the subscript on PRO is intended to mean; I assume that it is a further restriction which insists that the mother of this PRO is N. However, the result of the rule is that the following are predicted:

(1-47a) * Many old of the men
(1-47b) * Your of the books
(1-47c) Many of the men

In (1-47a) and (1-47b), *old* and *your* are not marked [+partitive] and PRO is not interpreted. Jackendoff suggests that the abstract unit interpretation could be extended to cover mass partitives. He also notes that the structure in (1-44) could provide an alternative description of simple NPs like *many boys* if it were possible to delete the *of* (or if its insertion were optional) when the lower N3 does not have a specifier. This suggestion is rejected by Selkirk and I shall

review her arguments in section 1.2.5. below.

1.2.4.4. The Partitive Constraint

Jackendoff points out some restrictions on the types of specifier which can appear on the lower N3 node in (1-44). Thus NPs like **many of some men* and **all of many students* are ill-formed. The partitive constraint is introduced in order to rule these out and Jackendoff notes that, while the underlying nature of the constraint is not understood, it can be stated as (p.113):

(1-48) In an *of-N3* construction interpreted as a partitive, the N3 must have a demonstrative or a genitive specifier.

This is a semantic constraint; the demonstrative and genitive classifications are not syntactic. Jackendoff therefore assumes that it is up to the semantic component to provide an account of the partitive constraint and rule out syntactically well-formed NPs like *many of men* and *several of some men*.

The next construction considered by Jackendoff contains a group noun followed by an indefinite NP, such as *a bunch of daffodils* and *the herd of elephants*. His account of these pseudopartitives is based directly on the analysis provided in Selkirk (1977) and so I shall discuss the proposals with reference to the latter paper in section 1.2.5. below. Firstly, it will be useful to summarise the interesting aspects of Jackendoff's account of partitives as many of the central problems in determining NP structure have been highlighted in the latter sections.

1.2.4.5. Summary

There are three main parts to this summary. The first reviews the data which Jackendoff considers relevant, the second outlines his formal account, and the

third discusses some general points. To begin with the data, Jackendoff is assuming a fairly standard division of NPs into simple, partitive, and pseudopartive. Leaving aside the latter, there are a number of important questions to be be answered about the other two. The following points, two of which pertain to simple NPs and two to partitives, require to be explained:

Simple NPs:

A. Certain sequences of specifier are allowed:

(1-49a) The many problems
(1-49b) Those few answers

B. There are constraints on sequences of specifier:

(1-50a) * Several many men
(1-50b) * Many some students
(1-50c) * The this man
(1-50d) * The some people

Partitives:

C. There are restrictions on the lower specifier:

(1-51a) * Several of many men
(1-51b) * Many of some men

D. There are restrictions on the upper specifier:

(1-52a) * Your of the books
(1-52b) * The of the people

In order to account for these data, Jackendoff proposes the following mechanisms (with reference to points A-D in the previous section):

A. The use of two specifier positions (of N3 and N2) allows these sequences.

B. Jackendoff uses two mechanisms to explain these data. One is the specifier constraint, which says that (1-50a) and (1-50b) are syntactically well-formed but ruled out by a semantic restriction. On the other hand, (1-50c) and (1-50d) are not possible due to the syntactic classifications; *this* in (1-50c) and *some* in (1-

50d) are occupying the Quant slot when they are classified as Arts. Thus (1-50c) is both syntactically and semantically bad.

C. The partitive constraint is designed to rule these out. Once again, the constraint is semantic.

D. Specifiers are classified depending on whether or not they license a partitive.

One question which Jackendoff leaves open is whether the *of NP* part of a partitive should be treated as a PP or not. It clearly is not in a structure like (1-44), in which the *of* is inserted transformationally. Jackendoff notes that there is some evidence, mainly from extraposition, that this phrase should be seen as a PP, and I shall return to the question.

In general, then, Jackendoff is not concerned with providing a semantics for his rules in the same way as would be provided in modern frameworks such as GPSG (Gazdar et al. 1985), Categorial Grammar (e.g. Steedman 1985), LFG (Kaplan and Bresnan 1982), and so on. In fact, he is working in a tradition which explicitly rejects a close relationship between syntactic and semantic rules. As I mentioned in the introduction to this chapter, I am assuming that exactly this kind of co-operation is useful and demonstrable. Much recent work in syntax has been concerned with closing, or eliminating, the space between some kinds of syntactic and semantic information, and there are certainly criticisms to be made of Jackendoff's approach in the sense that it is unclear how anything general could be stated about the mapping from syntax to semantics.

As I mentioned in section 1.2.4.1., it is also not clear how some of the specifiers are to be classified, and the classifications which were given result in a fair number of ill-formed NPs. Some were pointed out by Jackendoff, such as **the much food*, but there are many others. Examples are **a several men, *every a*

little wine, half many mistakes and **much a few days.*

With reference to the Partitive Projection Principle (see (1-46)), it is not immediately obvious that the classification of specifiers into those that take partitives and those which do not (discussed in section 1.2.4.3.) blocks the introduction of lexical material under the same node which dominates PRO. Thus NPs like *some pencil of the book* may be allowed. Note that some lexical material is already allowed in this position (the group nouns) so limiting the position to PRO only is not possible.

Finally, Jackendoff's account makes use of a number of constraints which are not independently motivated. The partitive constraint, as Jackendoff himself notes, is purely for observational adequacy. I intend to show that fewer constraints are necessary if there are structural similarities between simple NPs and partitives. The following discussion of Selkirk's work investigates this issue as a background to her proposed distinction between pseudopartitives and partitives.

1.2.5. Selkirk

Selkirk (1977) provides a number of reasons for giving pseudopartitive NPs a different structure from partitives. This section reviews this discussion and looks briefly at some related data which appear in Eguren (1989). In order to assess Selkirk's suggestions fully, it is necessary to begin with her arguments concerning the distinction between simple NPs and partitives which lies behind the treatment of pseudopartitives.

1.2.5.1. Simple NPs and Partitives

Selkirk agrees with Jackendoff in classifying NPs into the two types which I assumed in the introduction to this chapter. Thus, "according to the syntactic characteristics of the quantifier and determiner elements specifying the head noun" (p.288), NPs are either simple or partitive. In previous work, she and other linguists had proposed an underlying partitive analysis for simple NPs. She therefore describes this Hidden Partitive Hypothesis (HPH), which appears in Jackendoff (1968), Selkirk (1970) and Bresnan (1973), and adduces arguments to show that the notion is wrong.

Before taking a brief look at the HPH, it may be wise to look more closely at the quote from Selkirk in the last paragraph. This statement could be confusing in that there is very little difference in the actual specifiers which appear in the two constructions. Selkirk's description of the structures distinguishes partitives by saying that they "contain a noun phrase within a noun phrase" (p.288) and have a basic structure as in (1-53):

(1-53) $_{NP}$some $_{Det}$ (of) $_{NP}$[her $_{Det}$ $_{N1}$[objections $_{N}$]$_{N1}$]$_{NP}$]$_{NP}$

It is not clear, therefore, that it is the characteristics of the specifier elements which distinguish simple and partitive NPs, and it may be more accurate to use Selkirk's suggestion that partitives contain a full NP inside the matrix NP while simple NPs do not.

1.2.5.2. The Hidden Partitive Hypothesis

The HPH is the suggestion that simple NPs are underlyingly partitives. Thus identical deep structures would be given to *many objections* and *many of the objections*. Jackendoff notes this possibility, as mentioned above. I have no intention of supporting the HPH, but there are reasons for saying a little about

Selkirk's criticisms. I shall argue later (chapter 3) that simple NPs and partitives can be treated in a very similar manner syntactically and semantically, and some of the objections which Selkirk raises to the HPH could also be levelled at my account if they are well-founded. I shall therefore attempt to forestall these criticisms by pointing to the relevant flaws in Selkirk's arguments. There are two main sources of data which could provide counter-examples to my proposals; agreement and extraposition.

Looking firstly at agreement, Selkirk uses the term in a broad sense to refer to the dependency which exists between the specifier and noun in a simple NP. She suggests that the features which are involved in this dependency are count, number, gender, and case (p.289). The proposal is therefore that combinations of specifier and noun are permissible only if they agree, and that these restrictions can more easily be stated in a theory which distinguishes the two types of NP. The evidence comes from examples such as (p.289):

(1-54a) She does not believe much of that story
(1-54b) We listened to as little of his speech as possible
(1-54c) How much of the frescoes did the flood damage?
(1-54d) I read some of the book

These are contrasted with:

(1-55a) * She does not believe much story
(1-55b) * We listened to as little speech as possible
(1-55c) * How much frescoes did the flood damage?
(1-55d) * I read some book (where *some* is [+mass])

Selkirk suggests that the sentences in (1-54) allow mass specifiers to appear with a singular count noun, while in the simple NP cases this is not possible. She is obviously assuming here a sub-classification of specifiers in terms of mass and count. In turn, I assume that this distinction is intended to explain data such as:

(1-56a) Many people
(1-56b) * Much people
(1-56c) A little wine
(1-56d) * A little people
(1-56e) Each man
(1-56f) * Much man

If the noun classes which I assumed in my introduction are accepted (singular mass, singular count, and plural), then the specifiers can be subcategorised accordingly and, as Selkirk suggests, the ill-formed NPs in (1-56) can be ruled out by feature clashes between the specifier and noun. A particular implementation of this feature concord is provided in chapter 3.

To return to Selkirk's statement that the NPs in (1-54) show that in partitives a mass specifier can appear with a singular count noun, the point here is that this is not possible in simple NPs, as (1-56f) shows. If the two types of NP are distinguished structurally, it is straightforward to state that specifiers must agree with the head noun in simple NPs. In partitive NPs, on the other hand, "no agreement between the higher quantifier and the lower noun phrase is required" (p.290).

The problem with Selkirk's argument here is that the latter statement is almost trivially false. It is true that different conditions apply, but there is certainly a dependency between the specifier and the noun in partitives which is very similar to the simple NP data. For instance:

(1-57a) Several of the tables
(1-57b) * Several of the table/wine

(1-58a) Much of the wine/table
(1-58b) * Much of the tables

In (1-57) *several* is [Num plural], and cannot appear with a singular count or mass noun. In (1-58), a reasonable explanation would be that *much* has the feature [Num singular]. Note that this example is in direct contrast to Selkirk's

(1-54c) *how much of the frescoes did the flood damage?* which I suggest is only marginally acceptable. It is clearly the case that some form of dependency exists which is sensitive to precisely the same features as Selkirk proposes for the simple NPs. The one exceptional case is the relationship of mass specifiers to the noun.

Selkirk's next argument has to do with the numeral *one*. However, as this does not pose a problem for my analysis, I shall ignore it except for one point. Under the heading 'Collective Nouns', she notes the following data:

(1-59a) One of the cattle
(1-59b) * One cattle
(1-59c) One of the people
(1-59d) * One people
(1-59e) One of the womenfolk
(1-59f) * One womenfolk

This is the first mention in this thesis of partitives formed with collective nouns in the 'lower' position. These pose a number of interesting questions, and some points about the general type of construction are made in chapter 4. However, for the moment, it is clear that Selkirk has misunderstood the term 'collective'. The examples in (1-59) are all strong plural nouns which do not behave in the same way as collectives. Quirk and Greenbaum mention *cattle* and *people* in this respect (Quirk and Greenbaum 1973, p.176), and it seems clear that *folk* and its compounds are in the same class. The following data contrast with that in (1-59):

(1-60a) One of the family
(1-60b) One family
(1-60c) One of the team
(1-60d) One team

Thus where the noun is clearly a collective, which can be defined roughly as being a semantically plural noun with singular agreement, there is no problem

in forming a simple NP with specifiers such as *one*. It should be noted immediately that the singular agreement, at least in British English, is not necessary; however the important point in the classification of collectives is that singular agreement is possible.

The second source of data which Selkirk uses to support the distinction between partitives and simple NPs concerns extraposition. These data are particularly interesting. As we have seen, the evidence of extraposition is often adduced by Selkirk in support of her arguments, and at this point it is worthwhile looking at her suggestions in some detail. Note that a criticism of certain aspects of Selkirk's use of extraposition appears in Oehrle (1977), and some of his arguments are reviewed in section 1.2.7. below in which general questions are asked about the validity of conclusions based, as Selkirk's are, on what are essentially introspected judgements of grammaticality. For the moment, I shall concentrate on the use Selkirk makes of extraposition. She begins by arguing that this kind of movement is much easier from simple NPs than from partitives. Her data are (pp.292-3):

(1-61a) Answers have been found to this classical mathematical problem
(1-61b) Reviews have been reprinted of Helen's first symphony

(1-62a) ?* How many of the answers have been found to this classical mathematical problem?
(1-62b) ?* Two of those reviews have been reprinted of Helen's first symphony

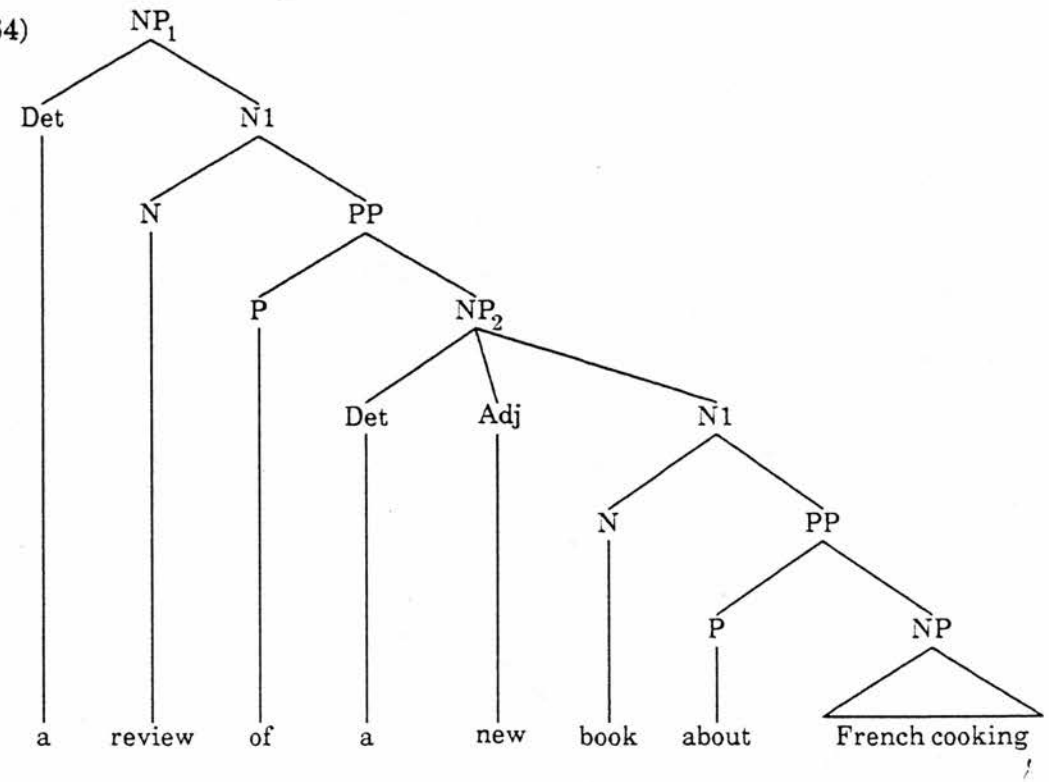
The explanation for this is found in a constraint which was proposed by Ross (1967) and Akmajian (1975) to account for the general properties of extraposition from NP. Akmajian states this constraint as follows:

(1-63) No element may be extraposed more than one cycle up from the cycle containing it. (p.119)

Selkirk provides an example of the operation of this constraint on the sentence *a review of a new book about French cooking came out yesterday*. The structure of

the subject NP in this sentence is given below (cf. p.293):

(1-64)



In (1-63), a cyclic node is either S or NP, which means that it should only be possible to extrapose the higher PP in (1-64). The lower PP (*about French cooking*) would have to pass through two NP nodes. Hence the following judgements are expected:

(1-65a) A review came out yesterday of a new book about French cooking
(1-65b) * A review of a new book came out yesterday about French cooking

Given Selkirk's account of the structure of partitives in which there are two NP nodes, as in (1-53), it is clear that extraposition of modifiers of the NP in the partitive phrase would move them through two cyclic nodes. The constraint in (1-63) should therefore apply. This is an important part of Selkirk's argument, and the extraposition data introduce a number of interesting questions.

Firstly, it has often been noted that extraposition, and movement in general, is more constrained when the containing NP is referential. There are discussions

of relevant facts in Oehrle (1977) and Wittenburg (1985), and I shall look briefly at Oehrle's paper below; in the meantime, (1-66) provides an illustration of the putative constraint:

(1-66a) A teacher was chosen with the right approach to children
(1-66b) *? The teacher was chosen with the right approach to children

In both cases, of course, the PP can be a verb (or sentence) modifier. The judgements are for the cases where it modifies the initial NP. However, in Selkirk's treatment of partitives she does not make any distinction between movement from definite and movement from indefinite NPs. Thus her data contain the following judgements (p.293):

(1-67a) Reviews have been reprinted of Helen's first symphony
(1-67b) Those reviews have been reprinted of Helen's first symphony

(1-68a) Answers have been found to this classical mathematical problem
(1-68b) The answers have been found to this classical mathematical problem

I find (1-67b) worse than (1-67a), as would be expected if movement from definites were restricted. However, there are other issues which interfere with judgements in these cases. Definite reference is typically to contextually salient objects, linguistic or otherwise. I shall say more about what constitutes context, and a little about what constitutes salience, in chapters 4 and 5, which deal with semantics. It will be argued there that these sentences contain a particular kind of definite reference which is at least partly due to the presence of the relational nouns *reviews* and *answers*. It will also be argued that some nouns are more strongly relational than others, and that this explains any difference in grammaticality between (1-67b) and (1-68b). There is much to say about the relationship between partitives and definiteness, and this topic will be discussed fully in chapter 4. It must suffice at the moment to note that the extraposition which Selkirk adduces in examples such as (1-62) is from a definite NP and that an investigation of the operation of extraposition should

attempt as far as possible to compare movement from similar contexts, where 'context' refers to the type of head noun in the matrix NP and the question of whether or not this NP is definite.

Another point about Selkirk's data is that her use of *those* in (1-67b) confuses judgements in that there is an interpretation of the sentence in which the extraposed PP is an afterthought. Thus this particular use of *those* carries, I think, a stronger sense of previously shared knowledge, which suggests that the NP *those reviews* is enough to refer successfully on its own. The later information is therefore appositional in a sense; if 'apposition' is used for cases where descriptions are juxtaposed, there may be a case for saying that the juxtaposition of partial information is also apposition. Nevertheless, this interpretation is less likely if the definite article is used, and so I suggest that the least marked version of this sentence is that given in (1-69a) below. Selkirk contrasts the grammaticality of this with the "ungrammatical" (1-69b):

(1-69a) The reviews have been published of Helen's first symphony
(1-69b) *? Two of the reviews have been published of Helen's first symphony

I cannot agree with these judgements. In the cases where the definite NP is referential and where the entire NP is necessary in order to fix the reference, I suggest that extraposition is equally unlikely from simple definite NPs and from partitives. A partial explanation for this is provided in chapters 4 and 5 below. I therefore propose the following grammaticality judgements for non-relational matrix nouns:

(1-70a) Problems were discovered with the gable wall
(1-70b) *? The problems were discovered with the gable wall
(1-70c) *? Some of the problems were discovered with the gable wall

As for the examples in (1-69), I suggest that both contain marked movements, but that neither is ungrammatical. I accept that (1-69b) is worse, but I propose

to explain the added difficulty in terms of the behaviour of relational nouns as discussed in chapter 4.

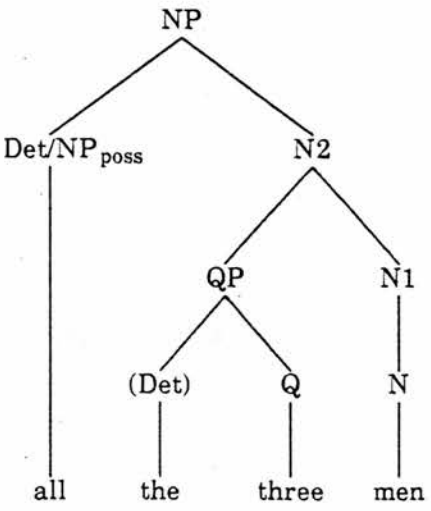
To summarise my position here, the main point is that most of the data adduced by Selkirk in favour of a structural distinction between partitives on the one hand and pseudopartitives and simple NPs on the other seem to me to have independent explanations. I repeat that I do not wish to support the HPH, but I do wish to argue for a uniform treatment of the three types of NP. Again, note that some of Oehrle's criticisms of Selkirk are reviewed below along with a report on a small experiment which was designed to test the acceptability of Selkirk's (and my) grammaticality judgements. It will suffice here to say that there is little evidence that speakers find sentences such as (1-69b) ungrammatical.

1.2.5.3. The Analysis of Determiners

Selkirk's arguments above are concerned with the distribution of specifiers in NPs. Her paper also discusses the question of how to fit determiners and possessives into the structure. I shall describe this section in a more cursory manner than the others for two main reasons; firstly, most of her conclusions are similar to Jackendoff's, and some of the argumentation is the same; secondly, in the areas where the theory is different, Selkirk fails to provide some crucial principles.

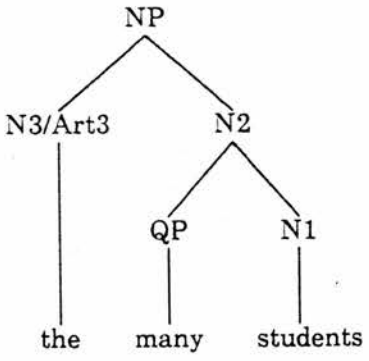
Selkirk suggests (1-71) as the structure for simple NPs:

(1-71)



This is similar to Jackendoff's (1-29), reproduced below as (1-72):

(1-72)



There are many questions to be asked about Selkirk's proposal, but unfortunately she does not provide the details which would be necessary to evaluate (1-71) properly. The difference, clearly, lies in the extra Det node which appears in Selkirk's tree. This slot accommodates the degree modifiers of specifiers, such as *too* and *so*, and the suggestion is that it can also hold the NP determiners. The evidence for this comes from sentences like (p.298):

(1-73a) Mary spoke the most convincingly
(1-73b) She ran the fastest
(1-73c) This was the most interesting

In these cases, Selkirk argues, the NP determiners have a degree interpretation, and this second possible analysis accounts for the ambiguity of the determiners

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in, for instance (p.299):

(1-74a) I was amazed at the people who showed up
(1-74b) I was amazed at the few people who showed up
(1-74c) Some people were observed entering through the back door

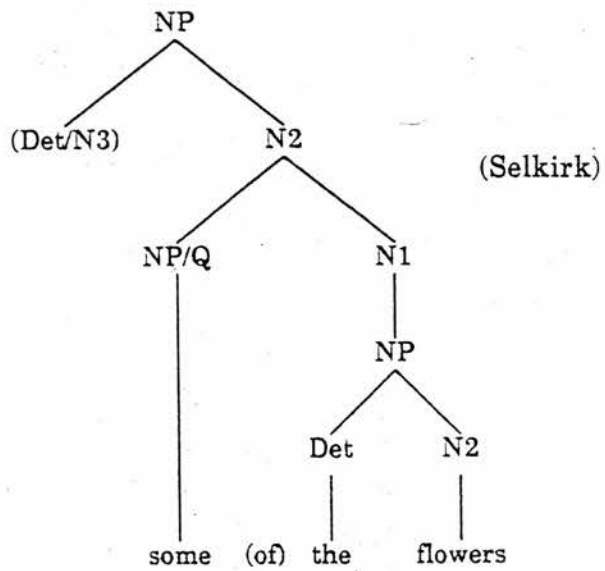
In (1-74b) the determiner is introduced under QP, in contrast to (1-74a). In the last example, the "quantity-like" (p.299) interpretation of *some* is explained by its source in QP. Whether or not Selkirk is right to suggest a structural basis for these contrasts, there are problems with her analysis. She points out herself that many ungrammatical sequences of determiners will be generated if the syntax allows NP–Det and Det–Det sequences. She states that a constraint to rule these out is necessary, but does not provide one. As shown in the previous discussion of Jackendoff's proposals, it is no simple matter to state the required restrictions when two specifier positions are available. Selkirk is effectively allowing three, and she does not provide the necessary syntactic and semantic classifications of the specifiers. Her proposed restriction only refers to determiners, but as she is apparently classifying *some* as a determiner in (1-74c), she will also have the problem of stopping sequences of this and specifiers. For example, *little* appears under a Q node in *too little interesting* (p.297), hence **some little interesting*, and so on, should also be allowed. It seems, then, that the constraint will be similar to Jackendoff's specifier constraint (see section 1.2.4.1.).

Generally, without a reasonably rigorous classification of the specifiers and without a statement of the constraint on determiners in sequence, it is very difficult to evaluate Selkirk's proposals in this area. She is more explicit in her subsequent discussion of pseudopartitives.

1.2.5.4. Pseudopartitives

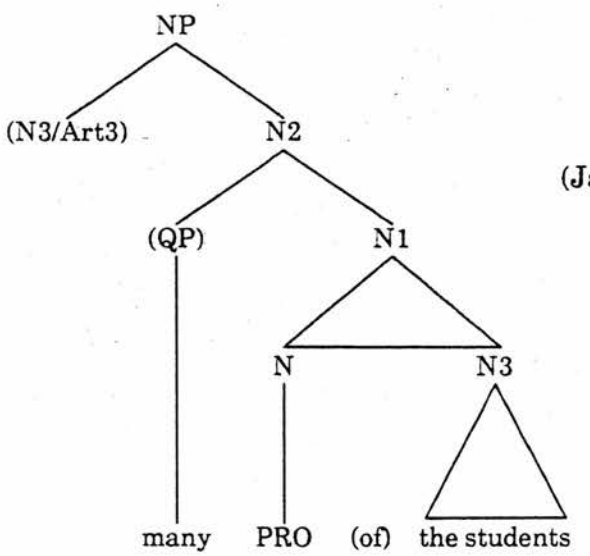
To review the situation so far, both Jackendoff and Selkirk have argued that a distinction should be drawn structurally between simple and partitive NPs while differing in the structures they propose. Selkirk's simple NPs are as in (1-71); she provides a tree diagram for partitives at the end of her paper which is shown in (1-75) and contrasted with Jackendoff's (1-39) (reproduced as (1-76)):

(1-75)



(Selkirk)

(1-76)



(Jackendoff)

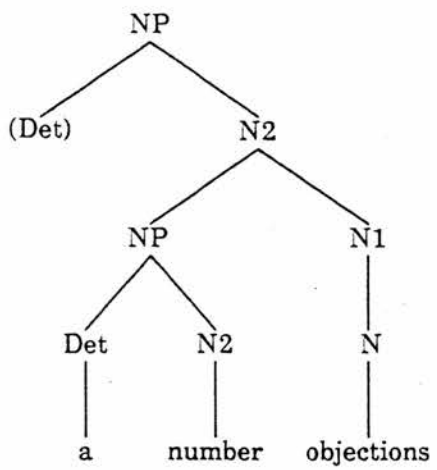
I shall discuss the structure in (1-75) after reviewing the arguments which Selkirk uses to support her analysis. The question at the moment is whether

NPs containing what Selkirk calls measure phrases (which I assume are the same class as Quirk et al.'s measure phrases and hence also Jackendoff's group nouns) should be assigned (1-71) or (1-75). The examples of these NPs given by Selkirk are (p.302):

(1-77a) A number of objections
(1-77b) Three pounds of stew meat
(1-77c) A bushel of apples
(1-77d) Loads of time

Selkirk argues that pseudopartitives should be seen as simple NPs, with the following structure:

(1-78)



Once again, a transformation is required to insert *of*. It could be noted that this, no doubt trivial, transformation must actually appear in at least two forms; it is not enough just to say that the context is NP__N1 as *of* appears after specifiers too. In fact, before examining the evidence for (1-78), there are a couple of points to make about the structure and Selkirk's description of it. She makes the following statement:

> A transformation will have to insert *of* in the context NP__N1. The Det under the highest NP will have to be either optionally developed, or null and 'indefinite', were this permitted by the constraint on Det in sequence. (p.302)

This is rather ambiguous. As pointed out previously, the constraint on Det in sequence is not provided, and it is not clear whether the optional development of the top level determiner comes under the scope of this constraint; if it is, the sense is that an item which is developed under this node is subject to the condition. However, the restrictions do not appear to be the same in this instance. Previously, the constraint was suggested in order to rule out certain sequences of determiners. Here, it appears that no sequence is possible:

(1-79a) * Some a number of people
(1-79b) * Many the number of students

In fact, Selkirk seems to overlook the fact that the lower Det node can only dominate the indefinite article in some of these cases. This is true of *a number* and *a lot*, and also of *a few* and *a little* when they are interpreted positively. I shall investigate the latter two instances more fully later; they should not be included in the discussion of pseudopartitives as they cannot appear in these constructions:

(1-80a) * A few of people
(1-80b) * A little of wool

However, looking again at (1-78), another problem is that there seems to be no reason why *a number of objections* has the indefinite article appearing under the lower Det node. The higher one is also possible, and the two possible derivations would suggest a situation analogous to that which exists with the sentences in (1-74) above. In the previous case this structural ambiguity was suggested as the basis for semantic ambiguity; there seems to be no reason to propose a similar ambiguity here. Having noted these problems, I shall examine the arguments that Selkirk adduces to support the simple NP analysis

of pseudopartitives.

1.2.5.5. The Partitive Recursion Constraint

The first argument that pseudopartitives have the same structure as simple NPs concerns what Selkirk calls the partitive recursion constraint. This is effectively the same restriction on partitives as that suggested by Jackendoff's partitive constraint in (1-48) above. Selkirk's formulation is (p.304):

(1-81) Rule out as ungrammatical any partitive construction containing *some*, *all*, *no*, Δ (= indef), and so on, in the lower noun phrase.

This is effectively the same as Jackendoff's (1-48):

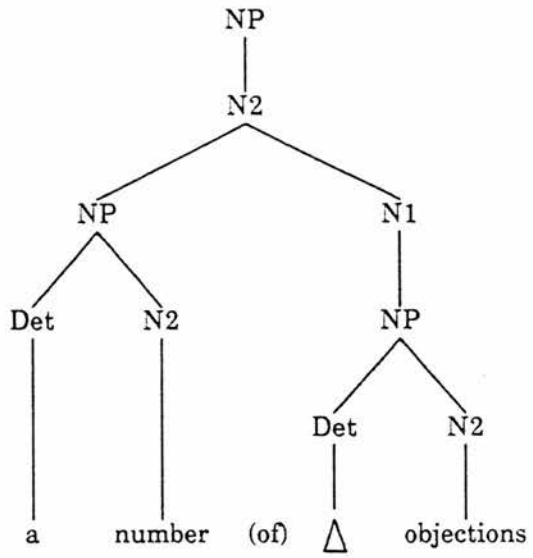
(1-48) In an *of-N3* construction interpreted as a partitive, the N3 must have a demonstrative or a genitive specifier.

Both Jackendoff and Selkirk note that these statements are purely descriptive. The result is more or less that the lower NP has to be definite. Selkirk suggests that if indefinite measure phrase partitives are treated as simple NPs, the partitive constraint can be applied to both quantifier and measure phrase partitives. In other words, the same constraint rules out all the examples below:

(1-82a) * Many of some apples
(1-82b) * Some of no men
(1-82c) * Five pounds of some apples
(1-82d) * A number of few people

Here (1-82a) and (1-82b) are quantifier partitives while (1-82c) and (1-82d) are measure phrase partitives. Selkirk's point is that it would be possible to analyse pseudopartitives with the structure below:

(1-83)



However, analysing pseudopartitives in this way means that the partitive recursion constraint cannot be stated as it is in (1-81) because (1-83) is a partitive construction with the 'empty' specifier Δ in the lower NP, and this is ruled out by the constraint. I suggest that this argument is completely circular. For Selkirk, the defining characteristic of a partitive was that an NP is contained within an NP. The constraint is designed to rule out certain specifiers in the lower NP, but there is no independent characterisation of the elements in (1-81). There is therefore no reason to include the bare plural indefinite determiner in the list. Without it, the more limited constraint still applies to measure phrase and quantifier partitives, ruling out **many of some men* and **a number of many men*, but pseudopartitives become partitives. There is certainly the subsequent problem of blocking **many of men*, but note that the *of* is inserted transformationally in a range of positions, as we have seen, so this is just one of the contexts in which the transformation does not apply. The question is whether or not the partitive recursion restraint and two NP structures constitutes a 'more general' statement than a weaker constraint and one structure.

1.2.5.6. Extraposition and Pseudopartitives

The argument in section 1.2.5.5. was formal in the sense that a more general statement was possible if pseudopartitives were not partitives. Selkirk now provides syntactic evidence, once again mainly the data provided by extraposition. The suggestion in this case is that different kinds of extraposition are possible with pseudopartitives and partitives. Two types of extraposition are investigated, beginning with the cases where the partitive phrase is moved (p.304; Selkirk's judgements):

(1-84a) A lot of leftover turkey has been eaten
(1-84b) A lot of the leftover turkey has been eaten

(1-84c) * A lot has been eaten of leftover turkey
(1-84d) A lot has been eaten of the leftover turkey

(1-85a) They devoured seven boxes of delicious fudge last night
(1-85b) They devoured seven boxes of your delicious fudge last night

(1-85c) * They devoured seven boxes last night of delicious fudge
(1-85d) They devoured seven boxes last night of your delicious fudge

These judgements could be contested. I find some, not all, of the extraposed pseudopartitives a little worse than the corresponding partitive, but I would hesitate to suggest a grammaticality difference between them. However, there are worse problems with this argument. Selkirk states that the different extraction possibilities can be ascribed to the fact that, in partitives, *of NP* is being moved, whereas the corresponding construction in a pseudopartitive is *of N1*. Thus it should be the case that all partitives, measure phrase or not, easily undergo this kind of extraposition. This does not appear to be the case:

(1-86a) *? Some had been eaten of the leftover turkey
(1-86b) *? They devoured much last night of your delicious fudge
(1-86c) * Many complained of the students
(1-86d) * A few were left of the revellers

Nearly all examples of this movement seem to me to be much worse than the

pseudopartitive cases. Note that Selkirk's analysis explicitly assumes that this sort of dislocation is actually possible; the examples which Jackendoff cited in (1-43) are used as evidence. I should note that there are some acceptable instances where an adverbial element appears between the specifier and the partitive phrase. Examples were provided in section 1.2.3. where it was suggested that the operation involved was some form of parenthetical interpolation, such as:

(1-87) A few, seemingly, of the MPs were singing loudly

Sentences like (1-86b) can be partially fixed in this way:

(1-88) ?? They devoured much, last night, of your delicious fudge

However, these examples are not normally understood in terms of extraposition, and so they are not really relevant in the present discussion. It is worth noting, though, that the relationship between extraposition and what I have called interpolation is unclear in the sense that there is no obvious dividing line. However, where the dislocation is more clearly the result of extraposition, as in (1-86a), the sentences are typically ill-formed.

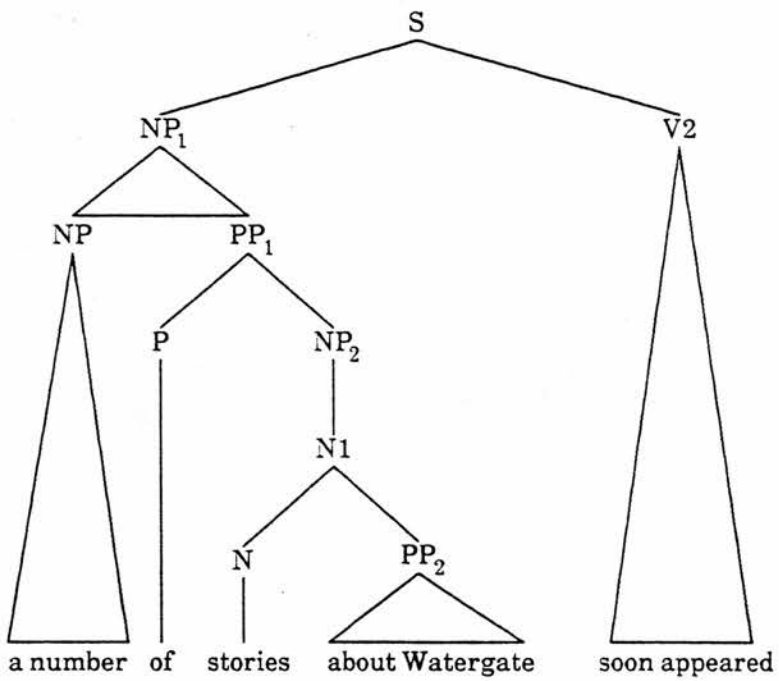
Generally, then, the data in (1-84) and (1-85) do not support a distinction between pseudopartitives and partitives on structural grounds. Selkirk now adduces another manifestation of extraposition. In this case the extraposed elements are modifiers of the lower NP, and the arguments are analogous to those advanced in section 1.2.5.2. to distinguish simple NPs and partitives. Selkirk's data are as follows (p.305):

(1-89a) A number of pictures of John were taken yesterday
(1-89b) A number of pictures were taken yesterday of John

(1-90a) A number of stories about Watergate soon appeared
(1-90b) A number of stories soon appeared about Watergate

If the structure of pseudopartitives were the same as the structure of partitives, the extraposed PP would be moving through two cyclic nodes. Again, Selkirk cites Akmajian (1975) and also Akmajian and Lehrer (1975) as evidence that this movement is impossible. Hence the structure of pseudopartitives is basically as suggested in (1-71), and the tree for (1-90a) is:

(1-91)



In the cases where what follows *of* is an NP (in other words, in measure phrase partitives) Selkirk argues that extraction is not possible. Among her data are the following (p.306):

(1-92a) A number of commentaries have appeared on Anne's latest book
(1-92b) ?* A number of the commentaries have appeared on Anne's latest book

(1-93a) A lot of reviews were published today of Helen's first symphony
(1-93b) ?* A lot of the reviews were published today of Helen's first symphony

I have already suggested that extraposition is less likely from definite NPs. This may partly explain the grammaticality judgements in (1-92) and (1-93),

and I shall expand on this proposal below with reference to Löbner (1986). Firstly, there are two more arguments advanced by Selkirk in support of the thesis that pseudopartitives and partitives have different structures.

1.2.5.7. Pseudopartitives and Relative Clauses

Selkirk argues that non-restrictive relative clauses have two possible attachments when the NP is a partitive, but only one when it is a pseudopartitive. The relevant data which she provides are (p.307):

(1-94a) They saw a lot of the famous paintings, several of which were by Sienese artists
(1-94b) She bought him dozens of those daffodils, only two of which were faded

In both these cases, the relative clause can modify either the lower NP or the higher NP in the partitive. Thus in (1-94a), for instance, either the paintings which were seen were by Sienese artists, or all the paintings present were by Sienese artists. Selkirk argues that this ambiguity is not present if the NP is a pseudopartitive (p.307):

(1-95a) They saw a lot of famous paintings, several of which were by Sienese artists
(1-95b) She bought him dozens of daffodils, only two of which were faded

The relative clause cannot modify *famous paintings* or *daffodils* in the latter examples, and I accept Selkirk's conclusions on the given data. However, I contest that there are further data which should be taken into account which refute her conclusions. Notice that bare plurals typically (though not necessarily) have generic reference. (For a full discussion of bare plurals, see Carlson (1977) and Link (1986b).) It is to be expected that there will be a restricted range of modifiers which can be applied in the generic cases; the relative clauses in (1-95) are clearly not possible. It is (either semantically or pragmatically) anomalous to form NPs like **paintings, many of which are by*

Picasso, are pleasant to look at. When a relative clause of the proper type is used with a bare plural, the ambiguity shown in (1-94) reappears:

(1-96a) She bought dozens of daffodils, which look nice on the table
(1-96b) He wrote a lot of linguistics textbooks, several of which make good bed-time stories
(1-96c) She owns a number of Jaguars, many of which are beautiful cars

Selkirk argues that the relative clauses can only modify NPs, which explains the non-ambiguity of (1-95a) and (1-95b). The examples in (1-96) suggest, given her assumptions, that two NPs are present here also, or at least, that partitives and pseudopartitives cannot be distinguished on these grounds.

1.2.5.8. Elision

The final distinction drawn by Selkirk is that it is possible, sometimes obligatory, to omit *of* from pseudopartitives. Her examples are (p.308):

(1-97a) She bought him a dozen daffodils
(1-97b) * She bought him a dozen of daffodils
(1-97c) She bought him a dozen of those daffodils
(1-97d) * She bought him a dozen those daffodils

She also points out that it is possible to have NPs like *a couple sheets of paper* and also that partitives and pseudopartitives seem to behave differently in certain constructions with ellipsis, such as (p.308):

(1-98a) They sold as many pounds of apples as they did pears
(1-98b) They sold as many pounds of apples as they did of pears
(1-98c) * They sold as many pounds of those apples as they did those pears
(1-98d) They sold as many pounds of those apples as they did of those pears

Selkirk suggests that her analysis allows a more general statement of this elision by providing a structural configuration where *of* may be absent; NP__N1. In the case of the examples in (1-97), I shall argue that this kind of elision is perfectly possible with certain partitives also, assuming that NPs like

all the men, both the students, and *half the vodka* should be treated as partitives. This seems sensible give the close semantic relationship to *all of the men, both of the students* and *half of the vodka*. Also, while the judgements on the second set of examples in (1-98) are plausible, there are similar sentences in which the distinction is not so clear:

(1-99a) ? We sold as many pounds of the apples as the pears
(1-99b) We ate as many of the plums as the cherries

If (1-99a) is acceptable, then *of* can also be deleted in Selkirk's NP__NP environment, while (1-99b) shows that the deletion can occur in the specifier cases also. The argument that a more general statement is possible in Selkirk's account does not hold.

1.2.5.9. Pseudopartitives and Noun Complements

According to Selkirk, there is a difference between pseudopartitives and constructions in which the *of* phrase is a PP complement of the head noun. Again, she uses extraposition as the test, as shown below (p.309):

(1-100a) A review of answers to your argument was given
(1-100b) A review was given of answers to your argument
(1-100c) * A review of answers was given to your argument

(1-100d) A number of answers to your argument were given
(1-100e) * A number were given of answers to your argument
(1-100f) A number of answers were given to your argument

These judgements are not so controversial as some of those discussed above; what is less acceptable is the subsequent argument that all the constructions which I have been calling pseudopartitives can be interpreted neither as pseudopartitives or as noun complement structures. The difference depends on which noun is taken as the head. Assuming that number agreement between the whole NP and VPs is evidence for the choice of head noun, Selkirk points to

the examples in (1-100) and suggests that pseudopartitives generally exhibit this kind of dual agreement. For example (p.309):

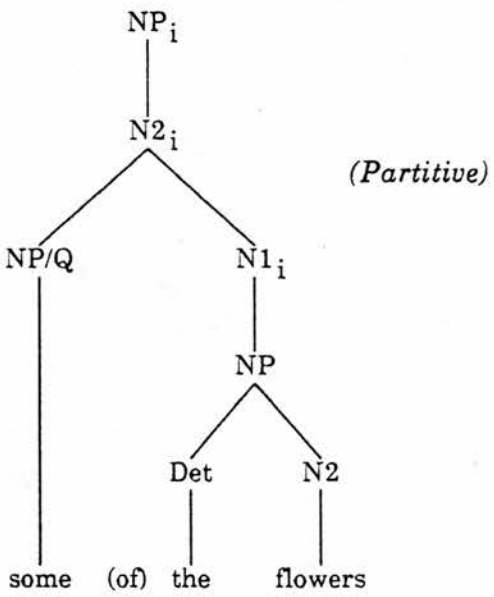
(1-101) An assortment of responses to the question was/were considered

Similarly, she suggests, pronominals and selectional restrictions give evidence of two possible heads (p.310):

(1-102a) That group of crazies really got itself/themselves into hot water, didn't it/they?
(1-102b) She broke/drank a bottle of wine

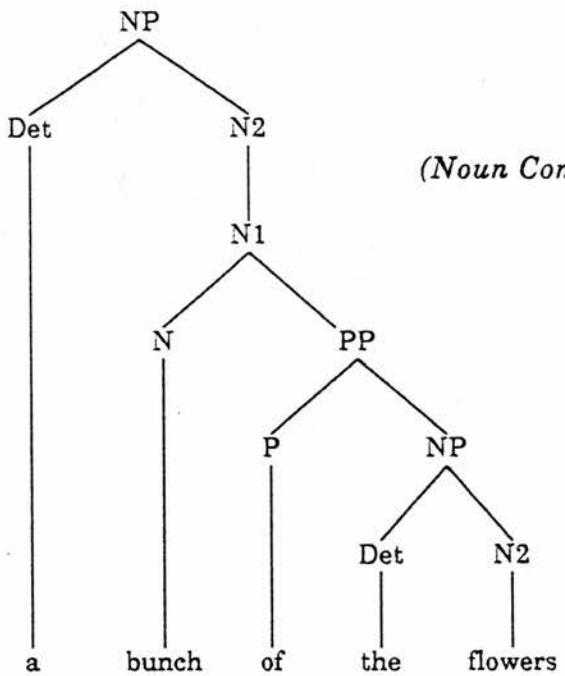
Selkirk argues that (1-102a) is ambiguous in that when agreement is singular, the sense of *group* is *organisation*, whereas the plural agreement signals a meaning like *a bunch* or *a lot*. These interpretations are attributed to the two possible structures for the NPs; either pseudopartitive or noun complement. Thus in (1-102b), *broke* shows that *bottle* is the head noun, and hence the structure is a noun complement, while *drank* is marked as being [+liquid], or some such, and so *wine* is the head noun in the corresponding pseudopartitive. The two trees proposed by Selkirk are shown below, where (1-103a) is the same as (1-75) above:

(1-103a)



(Partitive)

(1-103b)



(Noun Complement)

A statement of what constitutes a head noun is necessary; Selkirk's is as follows:

> The head noun of NP_i is that N that is dominated by $N1_i$ and $N2_i$, both dominated by NP_i, and that is not dominated by any category PP, VP or AP which is dominated by NP_i. (p.312)

This means that in the cases where the specifier node in (1-103a) expands as NP (for example, as *a number*), this NP will not contain the head noun

(which must be dominated by $N1_i$). In (1-103b), on the other hand, *flowers* is dominated by PP, and is therefore ruled out, which leaves *bunch* as the head.

It is useful to summarise Selkirk's argument here. She notes that some, if not all, pseudopartitives seem to be schizophrenic as far as agreement is concerned (taking 'agreement' broadly again), and suggests that this is the result of structural ambiguity. However, the measure nouns which appear in these pseudopartitives often, if not always, display the same agreement possibilities when they appear alone:

(1-104a) The whole bunch was/were drunk
(1-104b) That team was/were offered bribes
(1-104c) A huge herd was/were approaching a waterhole

The selectional restrictions and pronominalisation facts are more or less identical to the examples in (1-102) above:

(1-105a) We drank a whole bottle
(1-105b) They smashed the bottle
(1-105c) The group was/were pleased with ?itself/themselves

It could also be noted that specifiers which are normally subcategorised for plural arguments can take these nouns also:

(1-106a) A few of the herd
(1-106b) A number of the group
(1-106c) Several of the team

Generally it seems that, in the cases where the noun in specifier position is a collective, the more the predication emphasises the animacy (or individuality) of the members of the collective, the more likely plural agreement is. It could be argued that there is an understood head, of course, but this would result in some rather abstract syntactic structure, particularly when the understood head is *people* (as in the case of *team* or

crowd) in which case it is typically missing. If these items are inherently ambiguous, there is no need to resort to structural distinctions to explain the data.

1.2.5.10. Phrase Structure Rules

Selkirk employs the following PS rules:

NP → (Det) N2
NP → (NP_{poss}) N2
N2 → (NP) N1
N2 → (QP) N1
N1 → N (PP)
N1 → N (S)

In order to handle partitives, one more is required:

N1 → NP

This latter rule will cause the grammar to overgenerate badly. It is not clear that the few restrictions that Selkirk has outlined will provide effective constraints. She also says nothing about the version of X-bar syntax she is assuming. The partitive rule could cause problems in attempting to provide a general principled account of head-hood. (The standard assumption being that Xn → Xm where $m \leq n$.)

It is also worth mentioning again that Selkirk claims that the original distinction between partitives and simple NPs lies in the characteristics of the specifier elements. This is not so; the only difference is the one rule which expands N1 as NP rather than N.

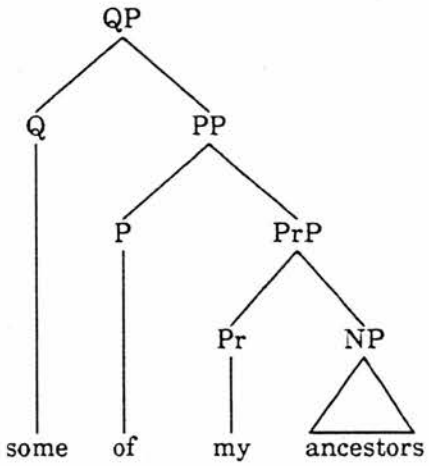
1.2.6. Related Data

As we have seen, Selkirk bases her distinction between simple and partitive NPs almost solely on extraposition data. A recent discussion of Spanish partitives in Eguren (1989) contains data which are similar in that they concern movements of sub-constituents of NPs in question formation. I shall review this data and some of the arguments briefly here.

As we shall see, Eguren's account of partitives is partly compatible with the grammar which is developed below in chapters 2 and 3. Notably, he rejects the Empty Nominal Hypothesis (ENH) which states that there is an empty nominal immediately following the specifier in a partitive. The ENH is assumed in Jackendoff's account, as discussed above. Eguren provides a number of arguments which depend to some extent on the formal nature of Government and Binding Theory (see, for example, Van Riemsdijck and Williams (1986)) in order to argue that the ENH should be rejected in favour of an account which allows specifiers to select different kinds of arguments. I shall say nothing about these formal objections here as I shall assume that, whether or not empty nominals are a feature of the grammar, an analysis which accounts for the data without them is generally to be preferred.

Eguren's proposed partitive structure is shown below:

(1-107)



This is quite close to the structure which will be proposed in chapter 2; however, the node dominating *the students* in (1-107) is an NP, and here Eguren follows Selkirk in arguing that the distinction between pseudopartitive and partitive NPs is that partitives contain an NP where pseudopartitives have an N1. It must be accepted that Eguren's data, being primarily Spanish, may be correct for that language. However, as with Selkirk's data, some of his grammaticality judgements in the corresponding English data are problematic. The first relevant set of data concerns a suggested subject/object asymmetry which occurs in WH question formation:

(1-108a) ? ¿De qué libro$_i$ has leído Las reseñas t_i?
Of which book have you read the reviews?

(1-108b) ?? ¿De qué comentarista$_i$ has leído las reseñas t_i?
Of which commentator have you read the reviews?

In these examples *t* marks the original position of the WH element. When the NP from which the subject or object is extracted is indefinite, both movements are acceptable. Thus when *algunas reseñas* (*some reviews*) is substituted for *las reseñas* in (1-108), the resulting sentences are well-formed:

(1-109a) ¿De qué libro$_i$ has leído algunas reseñas t_i?
(1-109b) ¿De qué comentarista$_i$ has leído algunas reseñas t_i?

This is true also when the matrix NP in question is a pseudopartitive:

(1-110a) ¿De qué libro$_i$ has leído un monton de reseñas t_i?
Of which book have you read a lot of reviews?

(1-110b) ¿De qué comentarista$_i$ has leído un monton de reseñas t_i?
Of which commentator have you read a lot of reviews?

When the extraction NP is a partitive (or a pseudopartitive containing a definite) neither extraction is possible:

(1-111a) * ¿De qué libro$_i$ has leído un monton de las reseñas t_i?
Of which book have you read a lot of the reviews?

(1-111b) * ¿De qué comentarista$_i$ has leído un monton de las reseñas t_i?
Of which commentator have you read a lot of the reviews?

Before commenting on the grammaticality judgements, Eguren's argument here is that, if the *de* which appears in pseudopartitives is the same as the *de* in partitives, then the same subject-object asymmetry which is in evidence in (1-108) should again appear in (1-111). As this is not the case, he concludes that they are different. I suggest that this argument is rather tenuous. If it were possible to extract both subject and object, with no difference, then it might be accepted that this provides evidence. However, when no movement is possible, the question of whether or not the asymmetry is preserved is masked. I suggest therefore that these data provide no new evidence on the question of whether or not partitive *de* differs from pseudopartitive *de*. Eguren's remaining data are based on the same kind of movement, resulting from WH-question forms, and the crucial examples are provided by sentences such as (1-112a) and (1-112b), which are taken from the sets above (with Eguren's judgements):

(1-112a) ? ¿De qué $libro_i$ has leído las reseñas t_i?
Of which book have you read the reviews?

(1-112b) * ¿De qué $libro_i$ has leído un monton de las reseñas t_i?
Of which book have you read a lot of the reviews?

Although the previous argument was based on extraposition data, I suggest that the same criticisms may be levelled at Eguren's judgements. Again, it must be accepted that the situation may be different in Spanish, but I suggested in the discussion of Selkirk's data that movement from a definite NP is more difficult than movement from an indefinite NP, and the reason extraction from pseudopartitives is easier than extraction from partitives is based on this fact rather than on any fundamental structural difference. The English sentences supporting this claim which correspond to the latter data are:

(1-113a) Of which book have you read a lot of reviews?
(1-113b) ? Of which book have you read a lot of the reviews?

As noted above, I do not propose a grammaticality difference here, just an explanation for the less acceptable nature of (1-113b). In order to test the acceptability of my own judgements, a short test was devised to elicit other speakers' responses, and a brief summary of the results of this can be found in the following section in which Oehrle's objections to some of Selkirk's data are discussed. The test itself is listed in appendix B. Note that the discussion of relational nouns in Löbner's (1986) framework in chapter 4 is also relevant here.

1.2.7. Grammaticality

It was mentioned above that Oehrle criticises Selkirk's use of extraposition as evidence for categorising syntactic structures (Oehrle 1977). This section discusses some of these criticisms and summarises a

rough experiment which was conducted to solicit grammaticality judgements from a small set of subjects.

Oehrle points out that there are a variety of constraints on the acceptability of extraposition, and one of the factors he points to is the shape of the determiner in the matrix NP (p.319). I understand the 'shape' of the determiner to mean the set of features which will be associated with the item; thus distinguishing *the* as a definite determiner from the indefinite *a(n)*. Oehrle suggests that Selkirk in effect jumps to the conclusion that it is the prepositional nature of the structure in a partitive which makes movement difficult in examples such as (1-114) below:

(1-114) *? Some of the reviews have appeared of Claudia's book

According to Oehrle, the presence of a definite determiner makes extraposition difficult, and he offers the following judgements (p.319):

(1-115a) A review of Claudia's book was sent to me
(1-115b) A review was sent to me of Claudia's book
(1-115c) ?* The review was sent to me of Claudia's book

These judgements agree with mine, as suggested above. Oehrle also argues that Selkirk's assumption that movement from an NP within an NP is impossible runs into difficulties in explaining the apparent grammaticality of sentences such as (p.320):

(1-116a) How much of a proof actually exists of this theorem?
(1-116b) One hell of a review has just appeared of Mary's book

One solution to Selkirk's problems which Oehrle considers is to analyse determiner-noun structures with an intermediate bar level specification which does not constitute a cyclic domain, and the proposals in chapter 2

can be interpreted as an implementation of this analysis. In general, however, it is clear that merely stating the grammaticality or otherwise of certain structures is a rather unsatisfactory method of defining the data. In some cases, Selkirk on the one hand and Oehrle and I on the other flatly contradict one another in our judgements, and my disagreement with Eguren's data is similarly problematic. I therefore decided to circulate a few relevant sentences around CSTR in order to get a broader view of how these matters are seen by other language users. The test is listed in appendix B, and the results are summarised at various relevant points throughout the thesis.

For the moment, all that is necessary is to report that, in order to test the extraposition and WH-question judgements, sentences pairs such as those below were compared:

(1-117a) Of which book have you read a lot of the reviews?
(1-117b) Of which book have you read a lot of reviews?

(1-118a) A lot of the lectures were given last week on Russian history
(1-118b) A number of lectures were given last week on economics

In all, only thirteen people had the time to undergo this test, and so the results can hardly be claimed to be comprehensive. However, there is no reason to think that the subjects are unrepresentative and the actual judgements were fairly consistent. The responses to (1-117a) and (1-117b) are almost indistinguishable; in fact seven of the thirteen marked them equally. Most of the others slightly preferred (1-117b), but not all. Three people found (1-117a) 'unacceptable' and one found (1-117b) ungrammatical. These results, and those for the similar sentences which were tested, support the argument that there is no grammaticality split. In the extraposition cases, the distinction is clearer. Most people found (1-118a) worse than (1-118b). However, only two found the former

ungrammatical, while four found it perfectly acceptable. Again there is little evidence that a split is manifested here.

To conclude this section, I suggest that Eguren and Selkirk have not examined enough data to justify their assumptions. Following Oehrle's suggestion, I propose to account for some of the infelicities in terms of factors such as definiteness. The semantic properties of nouns such as *review* may also play a part, and it is this possibility which is discussed with reference to Löbner (1986) in chapter 4.

1.3. Summary

In the introduction to this thesis I quoted Selkirk on the fact that NP syntax is "not without its difficulties" (1977, p.286); many of these have now been highlighted. On quite a few occasions I have promised solutions to the problems in rejecting the existing analyses, and I will take this opportunity to review the important questions which have to be answered.

I stated in introducing the chapter that a featural analysis of nouns is required, and this topic resurfaced in discussing Selkirk's paper. There are problems in this area in deciding what kind of features are appropriate. For example, Selkirk uses [+liquid] at one point in order to state a selectional restriction, and it is not clear that this kind of feature is respectable in syntax. In fact, it is not even clear that [±mass] is strictly a syntactic feature. One problem is that the use of such devices in order to explain distributions has no obvious restrictions. I will limit myself to a very few in characterising the important nominal classes; basically just the two which are necessary to distinguish singular mass, singular count, and plural nouns (see chapters 2 and 3 for details).

I began by suggesting that the distinguishing characteristic of a partitive NP might be semantic. I noted that this is a very traditional view and mentioned that formal semantics, in the shape of a particular application of lattice theory, might provide a useful characterisation. I spent some time criticising the work of Stockwell et al., Jackendoff, and Selkirk, who propose a fairly radical structural distinction between partitives on the one hand and simple NPs and pseudopartitives on the other. I have argued that the evidence which they provide does not support the distinction and that it is possible to provide a fairly uniform analysis. The following chapter provides the basis for such an account.

The issue of the partitive constraint was raised, first in Jackendoff and then in Selkirk. Both assumed that the precise statement of this is to be left to the semantics. In Jackendoff's case, he also noted that there are restrictions on the matrix specifier which must be accounted for in order to rule out NPs like *your of the books* and *the of the men*. He provided a stipulation of this in terms of arbitrary syntactic features. (Arbitrary in the sense that they are not otherwise motivated.) I intend to show that the partitive constraint and this latter restriction are one and the same. The partitive constraint has been interpreted to mean that the lower NP in a partitive must be definite, and this leads to two important areas of research; firstly in providing a reasonable account of definiteness, and secondly in showing how this account explains partitives. The chapters below on semantics attempt to supply the required characterisation of definiteness. Firstly, however, the following chapter introduces the formal framework in which my account of NP syntax is set and provides a basic analysis of simple and partitive NPs.

Chapter 2

A Grammar of Partitives

2.1. Introduction

This chapter introduces a basic account of NP structure in the light of the arguments presented in the previous chapter. The analysis is then extended, and occasionally amended, as further data are taken into account. As stated in the introduction to chapter 1, the general background I am assuming is provided by context-free phrase structure grammars along the lines of GPSG (Gazdar et al., 1985; henceforth GPSG85). The brief NP section in the latter book can in turn be traced back to the account of NPs suggested in Chomsky (1970).

The most important parts of the grammar which is presented here have been implemented in the language model which was written for the Alvey Speech Input Project (SIP) in the Centre for Speech Technology Research (CSTR) at the University of Edinburgh. I shall refer to this as the SIP grammar, a working version of which is contained in Appendix A. The high level representation is based on work by Phillips (Phillips and Thompson 1985, Phillips 1987) which provides a compiler which maps from the rules as shown to a machine-readable form and a parser for the compiled rules. Section 2.3. below provides an introduction to the important aspects of this work. The compiler which is described in the above papers has undergone fairly substantial changes, the most fundamental of which is perhaps due to the use of term rather than graph unification in the chart parser in the present system. The details of these alterations can be found in (Black 1989). However the basic approach has changed little and the functionality of the original formalism has been mostly retained. Generally, the grammar is an example of a unification-based

formalism as described in Shieber (1986). Some parts of the grammar have also been written in D-PATR (Kartunnen 1986), which is based on PATR-II (Shieber et al., 1983). This provides mechanisms not available in the Phillips framework for implementing the lexical rules which are mentioned below.

The Phillips package is a very close relative of the (later) grammar formalism which is described in Grover et al. (1989), and the actual grammar which is provided with the system will be referred to here as the Alvey grammar. The Alvey grammar contains an account of partitives which is discussed at the end of this chapter. One important area in which the formalisms differ is in the syntax of propagation rules (see section 2.3.1.); the Alvey system is more precise and allows a neater representation of, among other things, the Control Agreement Principle (section 2.3.1.). However, as this disparity is not crucial for the purposes of providing a formal background to the analysis of NPs which is presented here, a translation of the given rules into the Alvey system was not warranted.

It must be emphasised that not all the suggestions made here have been implemented. There is no connection, for example, between the PATR-II implementation of lexical rules and the rest of the grammar; it is assumed that the separate components could be combined in a single formal framework. It may be that the mechanism for handling lexical rules which is provided in the Alvey system means that a complete representation is possible in the latter framework. However, the essential aspects of my analysis are embodied in the grammar, and it should be clear that the extensions which are suggested are almost certainly easily implementable.

There are a number of places where the description of the grammar rules goes into much more detail than is to be found in any of the syntactic descriptions mentioned in chapter 1. This is partly due to the fact that the rules are

intended for fairly direct implementation, but is also, I feel, a desirable feature which reveals quite a few unexpected problems. The level of detail in the discussion of the complex specifiers *a number* and *a few* is an example. I am assuming that there are good reasons in attempting to be as explicit as possible when dealing with high-frequency constructions, and some evidence is provided below on relevant frequencies. One argument is that a rough measure of at least one kind of markedness is provided by frequency of occurrence, and it therefore seems sensible to describe the frequent constructions first and subsequently to relate the marked cases to the more common forms.

2.2. Partitives as Simple Noun Phrases

In rejecting Selkirk's arguments in favour of a structural distinction between partitive and simple NPs in the discussion in chapter 1, I suggested a common analysis. The claim is that both partitive and simple NPs share the same basic configuration which comprises one or two specifiers with a nominal complement. The rest of this chapter attempts to support this claim and explores the formal implications. In chapter 3 it is argued that pseudopartitives have the same fundamental structure.

Possibly the best way to introduce the arguments is to point out that in many languages, for instance Polish, Russian, German, and Old English, partitives are formed using genitive nouns. It seems clear that a formal analysis of such constructions would look very different from the analyses of Modern English partitives suggested by Jackendoff, Selkirk, and others. (See chapter 1). I will argue here that such discrepancies are not necessary. In order to provide a more concrete background to the discussion I shall draw examples primarily from Old English, partly because the data are familiar to me, and partly because I feel that examining earlier forms of English is interesting and often

illuminating. The information on Old English which follows can be found in most of the standard grammars and texts, such as Campbell (1959), Mitchell (1978), Quirk and Wrenn (1979) and Whitelock (1979).

A few general points are worth making before looking at the data. Firstly, while Old English may be helpful in orientating a discussion of Modern English, I do not wish to claim that an analysis of Old English in any way underlies Modern English. Secondly, it must be accepted that the relevant data in Old English are anything but unequivocal. For one thing, the modern partitive form using *of* existed to a small extent beside the more common genitive partitive, as for example in *sume of þam cnihtum (some of the men)*.[1] In general there is a wider variety of constructions expressing the Modern English specifier/noun relationships, and in many cases the forms which became the Modern English specifiers appear to have the syntax and morphology of adjectives in Old English. Also, whereas in Modern English the specifier and the noun typically show some kind of concord, in Old English there are what appear to be fully productive examples such as *mid manegum māne* (lit. *with many man*) which would usually be translated as *many a man*. I shall assume that these latter cases, while apparently having the same semantics as the forms which do show concord, must be treated differently. A third point is that, in parallel with the appearance of the periphrastic partitives, there are a few examples where the expected genitive case does not appear; *sume hi* (*some of them*) where *hi* is the accusative form. Having noted these caveats, an Old English example of a genitive partitive would be as shown below:

(1) fēa hiora
few 3-GEN-PL
'a few of them'

[1] In the absence of a more suitable graphic character, I shall use þ for the Old English runic 'thorn' which represents the voiced and voiceless forms of the fricative represented by the Modern English digraph 'th'.

The important point is that many of the specifier/adjectives govern genitive case in simple NPs also, for instance:

(2) fela tācna
many sign-GEN-PL
'many signs'

Intuitively, therefore, it looks as if the same description should cover simple and partitive NPs of this kind; Old English genitive case appears to be descended from an earlier Indo-European ablative, and the suggestion that the specifier/adjective is being used to identify a subset of a larger set through this 'of/from' relationship seems promising. I noted above that it is unlikely that an analysis such as Jackendoff's or Selkirk's is suitable for the genitive partitives; in the absence of any evidence that single genitive nouns like *hiora* should be treated as PPs, the most straightforward analysis is that they are nominal and that the specifier/adjective insists on genitive case in this structure whether or not the noun is definite.

Having mentioned definiteness in the context of Old English, it would be wise to point out that the situation differs from Modern English, at least with respect to the behaviour of the 'articles'. The Modern English definite article *the* does not have a direct correlate in Old English where words which appear to be articles are also interpretable as demonstratives. The nominative singular masculine form *se*, which is the ancestor of the Modern English definite article, has a stressed form which can stand alone in the same way as modern *this*. Similarly, there is no clear candidate for an indefinite article. The ancestor of *a(n)* is *an*, which is the numeral *one* and which has much more the sense of a specific indefinite (sometimes called 'strong indefiniteness' and translated using *a certain*); this is true of the adjective *sum* also. The following examples illustrate this:

(3a) þær is mid Estum ān mægþ
there is among Estonians-DAT one tribe
'among the Estonians there is a certain tribe'

(3b) þā stōd him sum mon æt
then stood he-DAT some man at
'then there stood by him a certain man'

As with bare plurals in Modern English, the sense of indefiniteness is typically conveyed by having no determiner at all in both singular and plural. (See Quirk and Wrenn (1979, pp.70-72).) While these matters complicate the relationship between Old English and Modern English, they do not materially affect the main argument which I shall develop.

Given the existence of genitive partitive NPs in Old English and a range of modern languages with similar constructions, the question is what the status of the later English constructions which use *of* should be. It is often remarked that prepositions in Modern English fulfil two roles, one of which is to mark case. Many analyses of pseudopartitives such as *a number of problems* suggest that *of* is case-marking *problems*. If this is accepted (these points are discussed in detail later), then the question becomes one of deciding whether partitives contain a full PP or a case-marked nominal. This chapter investigates the implications of treating the partitive phrase as a non-maximal nominal and, where appropriate, compares this treatment with the standard analysis which assumes a full NP inside a PP.[2] It will be argued that many of the problems which arise in the standard analysis, such as the correct statement of the partitive constraint as discussed in chapter 1, are due entirely to the unnecessary adoption of a PP node. An important result of generalising across simple and partitive NPs is that the same constraints apply to both, and some of these constraints will be based on a general notion of contrastive distribution

[2] The assumption that an NP is present in the partitive phrase does not entail that the phrase itself is a PP, of course. Jackendoff's and Selkirk's proposals inserted the preposition transformationally.

which can only be stated satisfactorily if there is just one NP node present in the structure. The proposal means that the definite article and the demonstratives must be given entirely separate classifications from specifiers; most accounts treat quantifiers and demonstratives as separate sub-classes of the specifiers, here they have nothing in common. The following section introduces the necessary aspects of Phillips' work on representing grammar rules before discussing the actual rules used.

2.3. A Noun Phrase Grammar

As mentioned in the introduction, I am assuming the formal background which is provided by GPSG, specifically by GPSG85. However, I also mentioned that the discussion is built around a working grammar and parser, and this entails a number of amendments to the formalism. The basis of GPSG85, is straightforward; complex syntactic categories are built from feature-value pairs in what is now a standard method of representing grammatical information. Thus, to take the example of the representation of a word such as *student*, the grammatical category which is typically associated with this is something like [Nominal +, Verbal −, Bar 0, Num sg]. This category (for expository purposes only), thus contains the information that *student* is nominal, not verbal, lexical ([Bar 0]) and singular. These combinations of feature-value pairs provide an extremely powerful method of representing the required information, and the Phillips version of GPSG employs them in standard fashion. Note that I have accepted the convention that prefixing a feature name with + or − is short for [*Featurename* ±]. This convention is recognised by the compiler.

Another GPSG convention is the use of what are typically termed 'aliases' in rules to make the representation of categories more concise. Again, the Phillips system allows declarations of this type and so, for example, the symbol *NP*

represents the feature specifications [+Nominal, −Verbal, Bar 2]. Fundamentally, therefore, the Phillips formalism builds on the normal apparatus of GPSG; however, the section below discusses an important departure from the standard which is assumed in the SIP grammar.

2.3.1. Feature Propagation Rules

Phillips' system employs Feature Propagation (FP) rules as a method of simplifying the various GPSG feature instantiation principles. There are five such principles in GPSG85:

1. The Head Feature Convention (HFC), which specifies that certain designated features must be identical on the mother and head daughter (the latter being specified in the rules) unless other principles intervene;

2. The Foot Feature Principle (FFP), which controls the appearance of gaps and the behaviour of reflexives, reciprocals and relative clauses;

3. The Control Agreement Principle (CAP), which mainly ensures agreement between, for example, subjects and verbs;

4. Feature Specification Defaults (FSDs), which specify values for features which are not explicitly represented in categories;

5. Feature Co-occurrence Restrictions (FCRs), which restrict the makeup of categories by ensuring that certain feature-value pairs cannot appear on the same category.

Phillips argues that this should be simplified; partly in order to make the implementation easier and partly, he suggests, because the complexity in this area in GPSG85 makes the formalism hard to understand and manipulate. His answer to these problems is to invent a fourth type of GPSG grammar rule. GPSG85 has three types of rule; Immediate Dominance rules which specify the mother-daughter relationships; Linear Precedence rules which order the daughters in a local tree, and Metarules, which are used to express generalisations across rules and hence capture, for instance, the correspondence between active and passive sentences. Phillips proposes the introduction of FP

rules as well in order to simplify the various feature principles and, as mentioned above, in order to design an easily implementable system.

The use of an example rule is probably the best way to illustrate FP. Let us assume that the grammar contains a rule **N1 → Adj N1** for analysing (any number of) adjectives. Typically, the HFC would be used to specify feature correspondences between the agreement features on the N1 mother and the N1 daughter. Very roughly, the relevant part of the HFC in GPSG85 accomplishes this by requiring that the set of head features, and their values, which are instantiated on a head daughter must be identical to (or a superset of) the head features on the mother. The set of head features is explicitly declared, and in each rule one daughter is specified as the head. Thus assuming that *Agr* is defined as a head feature and that the N1 daughter is specified as the head, the HFC will ensure that the value for *Agr* is passed on. In the SIP grammar, this feature correspondence could be represented directly in the rule as follows:

(2-4)

```
[N1, Agr $1]  →
                    Adj,
                    [N1, Agr $1]
```

By convention, square brackets delimit categories and commas separate feature-value pairs and categories in rules. Also, the use of $ with a number signifies a variable which must unify with a variable of the same name. As we shall see below, there are a number of rules with this general configuration in the grammar, and in each case the agreement features on the mother and daughter N1s must match. As shown above, the HFC specifies exactly this relationship, and the following is an FP rule which represents the same information:

(2-5) {Agr} [N1], @F : [N1], @F

The colon separates mother category specifications (on the left) from daughters. The rule states that, for the feature *Agr*, in a rule which contains an N1 mother and an N1 daughter, the feature must be instantiated on both and the values must be the same. The basic FP rule therefore contains information about the set of features in question (inside curly brackets), a specification of the mother category (inside square brackets), an instruction on what to do with the feature on the mother (in (2-5) the feature is instantiated on the mother as indicated by '@F'), a specification of the daughter category which must also match (inside square brackets), and an instruction on what to do with the feature on the daughter. The two instantiations must unify, and so the actual grammar rule now need only contain the information below:

(2-6)

N1 →

Adj,
N1

As discussed below, this high level rule is compiled into Thompson's FBF representation (Thompson 1987), at which point the FP rules expand the phrase structure rules with the necessary features and values. As there are a number of rules in the present grammar of the form **N1 → X N1**, the FP rule (2-5) will ensure that in each case agreement is forced between the N1 mother and the N1 daughter. Note that, as it is shown, (2-5) will apply to all N1s, whether or not they already have specifications for *Agr*. In order to restrict the application to just those categories which do not have *Agr* instantiated on them, the following modification is necessary:

(2-7) {Agr} [N1, ¯F], @F : [N1, ¯F], @F

The rule now states that, for the feature *Agr*, in a rule which contains an N1 mother and an N1 daughter, neither of which have an instantiation of the feature in question (¯F), *Agr* is instantiated on both and the values are the

same. This method can be used to represent most of the information contained in the five GPSG85 feature conventions. To take one more example (from Phillips 1987), assume there is an FSD which says that any NP which is unmarked for case is by default accusative. The FP rule which states this is:

(2-8) { } X : [NP, ¯Nom], −Nom

The use of *X* in the rule means that any category is matched, and so (2-8) states that, in any rule with an NP daughter which does not have a value for the feature *Nom*, the feature *Nom* with the value '−' is instantiated on the NP. The mother is unchanged.

Generally, then, a set of rules such as (2-7) are provided which, taken together, implement the HFC. It is often possible to reduce the number of actual FP rules by carefully designing the rest of the grammar in order to allow generalisations over local phrase structures. In the grammar which is described here, FP rules are used sparingly to capture some of the operations of the HFC. Metarules are not necessary.

One more important point concerns the use of IDLP. The separation of immediate dominance from linear precedence rules is not particularly useful inside NP, at least in the present system. There are few, possibly no, generalisations which suggest themselves as candidates for this kind of representation, and so all the rules here assume that linear order and dominance are represented simply as in conventional phrase structure rules. The Phillips compiler allows this.

There are a number of theoretical matters arising from the use of FP rules, and I shall mention them briefly. Firstly, as mentioned above, the basis of Phillips' approach assumes that the grammar is represented in a high level rule format which is then compiled into low level (FBF) rules. There is no need to go into

the details of FBF here; it will suffice to note that it is very similar to PATR-II in many respects and provides a computationally tractable, and theoretically sound, grammar rule formalism. Phillips points out that many earlier implementations of GPSG, such as Gawron et al. (1982), Phillips and Thompson (1985), Evans (1985) and (for morphology) Ritchie et al. (1986), build a good deal of the grammar into the parser in the sense that there is no separate statement of some of the principles of the grammar; instead, the principles tend to be implicit in the actions of the parser. While this is a very reasonable response to the problem of handling some aspects of the feature conventions, the result can be inefficient for parsing. For example, the use of Immediate Dominance and Linear Precedence (IDLP) format often results in a great deal of unnecessary work for the parser whereas, in English at least, 'spelling out' the various possibilities in an initial compilation stage does not expand the total number of rules to an unacceptable level.

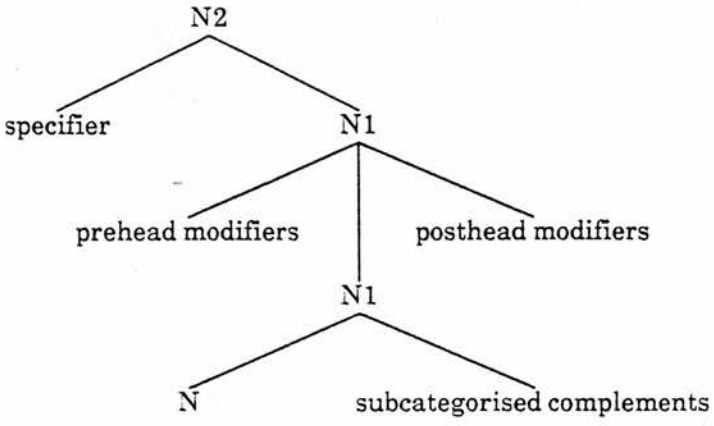
It is true that the use of FP rules means that there is no single statement of, for example, the HFC. Instead, a set of FP rules do the work of the convention, and it could be argued that there is a possible loss of a generalisation in this strategy. However, as suggested above, in many cases it is possible to design the phrase structure rules in such a way that a single FP rule captures much of the content of the HFC.

These points do not, of course, argue for pre-compilation as a theoretic device; my concern here is to provide the background for the representation of the rules in this chapter. However, I agree with Phillips' suggestion that the use of FP rules also often provides a more perspicuous representation than the HFC as formulated in GPSG85. Further details on the syntax and use of FP rules are given below at appropriate points.

2.3.2. Basic Noun Phrase Rules

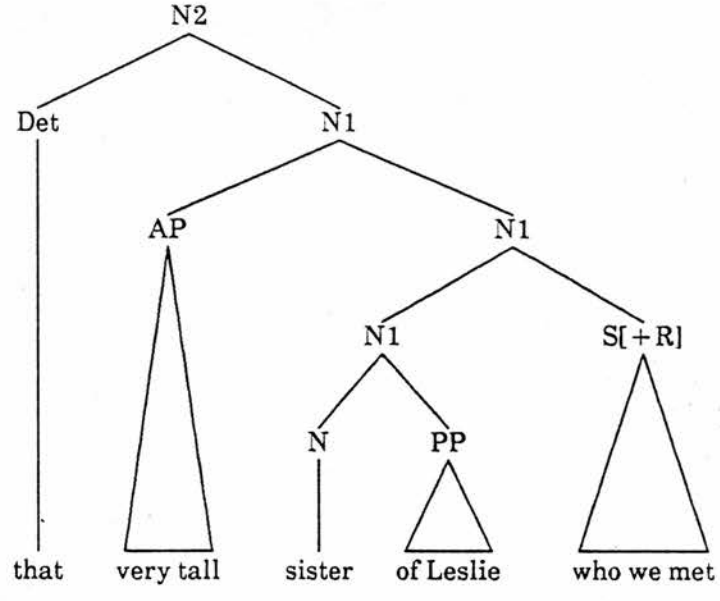
In GPSG85, the general structure of NPs is given as:

(2-9)



An example derivation is provided in Gazdar et al. for the NP *that very tall sister of Leslie who we met*:

(2-10)



In contrast to Jackendoff and Selkirk, there are only three levels in the nominal projection and one specifier slot. It is necessary therefore to supply an alternative account of NPs which contain two specifiers, such as Jackendoff's *those several dwarfs*. This problem will be addressed at length below; firstly, however, I will introduce an analysis of partitives which assumes a similar

structure to (2-9).

The basis of this analysis is the assumption that the rule **NP → SpecP N1** can be used to generate both partitive and simple NPs. (See the tree structures in (2-12) and (2-13) below.) This assumption requires *of the women* in *some of the women* to be an N1, and a couple of preliminary points should be made about this. First of all, I should note that, following the discussion of Old English above, I will often refer to structures like *of the women* as 'case-marked' N1s. As I also noted earlier, it will be argued below that it is useful to distinguish these from PPs. It will be further argued below that the first daughter in this rule has to be a specifier phrase, rather than just a single specifier, in order to provide a satisfactory treatment of complex specifiers such as *a number* and *a few*. For the moment, however, it can be assumed that there is a unary rule **SpecP → Spec**. The most important point to note is the contrast with Jackendoff, Selkirk, and Stockwell et al.'s accounts in which *the women* in *some of the women* is an NP.

In the same way as some prepositions case-mark N1s, it will be assumed that the definite article adds a feature to N1s. Apart from agreement, and the normal categorial and bar level specifications, there are therefore two features in the categorial definition of an N1. The first five rules which will analyse NP are (schematically):

(2-11a) NP → SpecP N1
(2-11b) SpecP → Spec
(2-11c) N1 → Pcm N1
(2-11d) N1 → Det N1
(2-11e) N1 → N

These rules are expanded with features below; in order to mark the relationship between the expanded rule and the schematic form, I have adopted the convention that the repetition of, for instance, (2-11a) will be marked as (2-

11a'). Perhaps the only unfamiliar element in the rules is the category *Pcm* which is the symbol for case-marking prepositions. The symbols themselves are aliases for more complex categories, and table II-I introduces the values as used in the rules in (2-11) and elsewhere in the grammar.

The categories are thus built up from combinations of the basic feature-value pairs. All of the given aliases are self-explanatory apart from the QDet and Int; the former will be explained in chapter 3. The category Int is used for adverbial intensifiers such as *very* and *rather* which will only appear as modifiers of adjectives in the SIP NP grammar in cases such as *very large students*. As for the actual features in the categories, table II-II states the values they can have in the present grammar.

As shown in table II-II, *Agr* and *ArgAgr* are category-valued features, and the category in question consists of *Num* and *Mass*. It should also, of course, include *Person* and other features where necessary. While there is not a huge advantage in this move for English, it seems clear that in order to allow for some compatibility with languages which have much greater concord (including

NP	[−V, +N, Bar 2]
N1	[−V, +N, Bar 1]
N	[−V, +N, Bar 0]
SpecP	[Cat spec, Bar 2]
Spec	[Cat spec, Bar 0]
Det	[Cat det]
Pcm	[Cat pcm]
QDet	[Cat qdet]
AdjP	[+V, +N, Bar 2]
Adj	[+V, +N, Bar 0]
Int	[Cat int]

Table II-I: Alias Definitions in the SIP Grammar

Feature	*Description*	*Values*
Cm	Case Marking	{*of*, −}
ArgCm	Argument Case Marking	{*of*, −}
Def	Definite	{+, −}
ArgDef	Argument Definiteness	{+, −}
Num	Number	{*sg*, *pl*}
ArgNum	Argument Number	{*sg*, *pl*}
Ms	Mass	{+, −}
ArgMs	Argument Mass	{+, −}
V	Verbal	{+, −}
N	Nominal	{+, −}
Bar	Bar Level	{0, 1, 2}
Cat	Category	{*spec*, *det*, *pcm*, *qdet*, *int*}
Spec	Specified	{+, −, qdet}
Subs	Substantitive	{+, −}
Qu	Quantified	{+, −}
Agr	Agreement	*Category*
ArgAgr	Argument Agreement	*Category*

Table II-II: Feature Values in the SIP Grammar

gender, and so on), this grouping of features is appropriate and it does simplify the rules a little as we shall see. A few of the features are not self-explanatory; the use of each is described in this and the following chapter. To complete the background declarations, the compiler insists on a definition for each category, and the necessary statements are shown in table II-III.

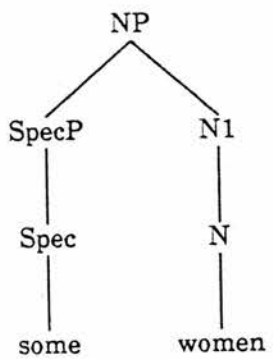
Each category in II-III is given a specific value for certain features where this is appropriate. The remaining features in the declarations will be used to fill out the categories with variables if the rules or lexical entries do not provide values. The only unusual case is perhaps the last; the compiler insists that all categories should be named, and as agreement is a 'category' (being the value of the category-valued features *Agr* and *ArgAgr*), it must be declared.

Category	*Definition*
NP	[[Bar 2], [−V], [+N], Agr]
N1	[[Bar 1], [−V], [+N], Agr, Def, Cm]
Noun	[[Bar 0], [−V], [+N], Agr]
Specp	[[Cat spec], [Bar 2], Agr, ArgAgr, Argdef, Argcm]
Spec	[[Cat spec], [Bar 0], Agr, ArgAgr, Argdef, Argcm]
Det	[[Cat Det], Agr]
Pcm	[[Cat Pcm], Cm]
QDet	[[Cat qdet]]
AdjP	[[Bar 2], [+V], [+N], ArgAgr]
Adj	[[Bar 0], [+V], [+N], ArgAgr]
Int	[[Cat int]]
Agr	[Ms, Num]

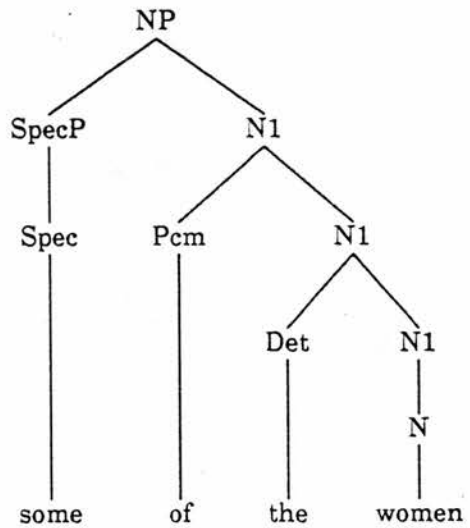
Table II-III: Category Definitions in the SIP Grammar

It was noted above that the separation of immediate dominance from linear precedence, as is assumed in GPSG85, is not particularly useful inside NP. The rules here are therefore straightforward phrase structure representations; the commas which separate categories are required by the compiler and do not indicate IDLP format. Thus, assuming suitable lexical entries, the schematic rules in (2-11) will generate *some women* and *some of the women* as shown below:

(2-12)



(2-13)



Note that, from now on, I shall usually omit intermediate non-branching nodes in trees to simplify the representations. Thus the *Spec* and *N* nodes need not be present in (2-13). There are a number of features on N1s which refine the analysis and prevent certain kinds of overgeneration. Thus, for example, the fourth rule in (2-11) is more fully represented as:

(2-11d')

[N1, −Cm, +Def, Agr $1] →
[Det, Agr $1],
[N1, −Cm, −Def, Agr $1]

This rule can be simplified by the use of FP statements. The FP rule (2-7) which was suggested above as an example is appropriate here:

(2-7) {Agr} [N1, ¯F], @F : [N1, ¯F], @F

This will ensure that the agreement features on the mother and the N1 daughter in (2-11d') match. However, in order to capture the sort of information supplied by the CAP, which in (2-11d') would specify agreement between the determiner and the noun (via the daughter N1), a little more work is required. As Phillips points out (1987, pp.14-15), the simplest method of supplying the information is to specify it directly on the rule as in (2-11d').

However, it is also possible to produce some of the effects of the CAP using FP rules. For (2-11d'), the following rule would suffice:

(2-14) {Agr} [N1], @F : [Det], @F

Rules (2-7) and (2-14), taken together, will ensure that agreement is forced between the daughters. It may be possible to make this kind of statement much more general, and not confined to specifications of the category of the daughter as in (2-14), by assuming a featural breakdown of the head along the lines of GPSG85. The example FP provided by Phillips is (amended slightly):

(2-15) {Agr} X, @F : [V2, ¯Head, ¯F], @F

This rule assumes the GPSG85 FCR which states that only verbal categories can be agreement targets, and also assumes that the feature *Head* appears on head daughters. Rule (2-15) therefore states that, in all rules which have a V2 which is a non-head as a daughter, if the V2 does not have a specification for *Agr*, then *Agr* is instantiated on the mother and daughter and the values must unify. The rule will apply to PS rules in which there is a non-finite V2 daughter, for instance, taking another example from Phillips:

(2-16)

V2 →
[H, Subcat 13],
[V2, Vform inf]

Rule (2-15) will combine with the FP rules which implement the relevant part of the HFC to ensure that the agreement features on the head match the agreement features on the non-finite V2. It is assumed in GPSG85 that the relationship between reflexives in such non-finite V2s and matrix subjects is governed by agreement, and that this explains the ill-formedness of (2-17b) below:

(2-17a) Mary wants to like herself
(2-17b) * Mary wants to like himself

The latter FP rule will thus insist that the agreement features on the infinitive clause have to match the agreement features on the main verb, and hence on the subject of the sentence. The features on the V2 will in turn ensure that the correct form of reflexive appears.

It is possible, therefore, to use the non-head specification along with FCRs to state generalisations about feature matches which encapsulate the CAP. As a result of these FP rules the PS rule (2-11d') becomes:

(2-11d'')

[N1, −Cm, +Def] →
Det,
[N1, −Cm, −Def]

It is not clear that this mechanism ultimately provides an appropriate method of capturing the full sense of the CAP as detailed in GPSG85, but for present purposes it will suffice. As noted in the introduction to this chapter, the Alvey system allows a neater representation of the CAP as it is possible to relate variables on specified daughters in a local tree. However, the need for this kind of generalisation is not particularly great inside NP, and in most cases below I shall state the required features on the rules for clarity.

Rule (2-11d'') captures the facts that it is not possible to add definiteness to case-marked N1s (**the of men*) and that recursion is blocked (**the the woman*). This is because the N1 daughter must always be indefinite and have no case-marking due to the stated values for *Def* and *Cm*. Note that it is implicitly assumed that all determiners are definite. As I shall argue below, the 'indefinite' determiners are more happily treated as specifiers, and so only the definite article and demonstratives are admitted under *Det* (genitive possessives should also be introduced here, of course).

The rule for adding case-marking is very similar to (2-11d''):

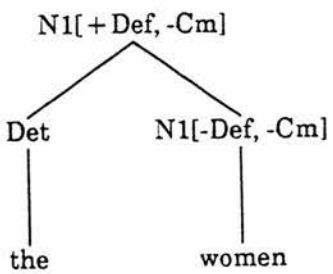
(2-11c')

[N1, Cm $2] →
[Pcm, Cm $2],
[N1, −Cm]

The use of the category Pcm for *of* is intended to distinguish its use here from 'real' prepositional examples, as mentioned previously. The implications of this suggestion will be examined in more detail below. As in (2-11d'), recursion is blocked (**of of men*) due to the daughter N1 being specified as [−Cm], and the value for case is passed to the mother from the preposition. It is possible to add case to either definite or indefinite N1s; *of men* and *of the women*.

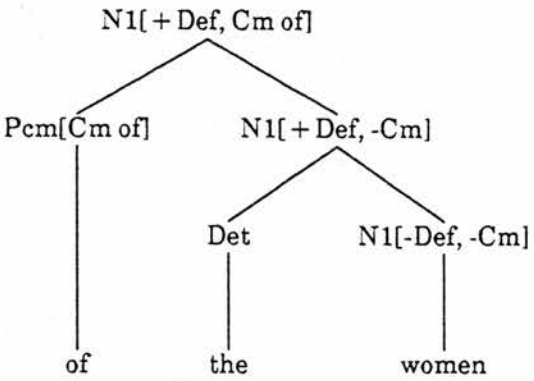
Looking at the tree provided above for the NP *some of the women* (2-12), the following is a fuller representation of the features involved in the nominal part (*of the women*) as the structure is built, starting with the analysis of *the women* using rule (2-11d''):

(2-18)



Case marking can be added using rule (2-11c') to give the following structure for *of the women*:

(2-19)



Although rules for PPs and relative clauses are not provided here, it can safely be assumed that these will be N1 modifiers, in which case they would be analysed using rules such as **N1 → N1 PP** and **N1 → N1 S**.[3] The values for case-marking and definiteness in such rules should be passed between mother and head daughter in the same way as agreement, and this can easily be achieved by extending FP rule (2-7) as shown below:

(2-7′) {Agr, Def, Cm} [N1, ¯F], @F : [N1, ¯F], @F

Thus for the features *Def, Cm* and *Agr* (taken in turn), in any rule with an N1 mother and an N1 daughter, neither of which is specified for the feature, instantiate the feature on both N1s and unify the instantiations. As PS rule (2-11d′′) is explicitly marked for both case-marking and definiteness, only the agreement features will be affected, while in (2-11c′) both agreement and definiteness features will be added to the mother and daughter N1s.

The result of the two PS rules (2-11c′) and (2-11d′) is that there are four different sets of feature-value pairs which represent N1s (assuming one value for case-marking). The possible feature-value sets are:

[3] Although PP rules and Relative Clause rules are not provided, it should be noted that care has to be taken to avoid attachment ambiguities due to the large number of N1s in the structures which are being proposed. Some are easily avoided. For example, stipulating that the N1s which take modifiers must not be case-marked rules out many possibilities.

(2-20) [N1, −Cm, −Def, Agr $1] *student(s)*
[N1, Cm of, −Def, Agr $1] *of student(s)*
[N1, −Cm, +Def, Agr $1] *the student(s)*
[N1, Cm of, +Def, Agr $1] *of the student(s)*

It is necessary to ensure that N1s are marked as [−Cm, −Def] by default; definiteness is not a feature of common nouns in English in the sense that there is no morphological reflex. On the other hand, I shall assume for the present that values for case-marking other than *of* (nominative, accusative and genitive) are specified in the lexicon. These defaults can be achieved in a number of ways. It is possible, for example, to ensure that all nouns are directly marked [−Cm, −Def] in the lexicon and then that the features are passed from nouns to N1s using FP rules to represent the HFC again. There are also ways in which default feature values can be added to categories, such as lexical redundancy rules and (in the standard GPSG fashion) using FSDs. The following FP rule would produce the required result:

(2-21) {Def, Cm} X : [N, ¯F], -F

This states that, in all rules with N daughters, if the daughter is unspecified for *Def* and/or *Cm*, then [−Def] and/or [−Cm] should be instantiated on the daughter. The same result could be achieved by explicitly stating the values on the rule in the grammar which dominates the lexical nouns (2-11e), as shown below:

(2-11e′) [N1, −Cm, −Def] → N

It should be noted that, while this use of default values is unproblematic with definiteness, the situation with case-marking is not so straightforward. In effect, the same feature name is being used for two things; stating whether or not a category is case-marked and supplying a value if it is. This can cause trouble in certain situations; for instance, the assumption underlying GPSG is

that categories are freely expanded and feature values are instantiated from the set of given possibilities. In the present grammar the given values for case-marking are {*of*, −}. There is nothing, therefore, which appears to stop a category being expanded as [Pcm, −Cm], which is incoherent in that there are no possible matches for this in the lexicon. In such cases feature occurrence restrictions (FCRs) might apply as in GPSG85. The FCR below would produce the desired effect:

(2-22) [Cat pcm] ⊃ ~[−Cm]

This states that the category Pcm cannot have the value '−' for case-marking. However, as Phillips points out (1987, p.16), FCRs are not directly representable in his system. This is not a practical problem as the design of the parser means that categories are always specified and analysed bottom-up and the notion of free expansion is never applicable. Theoretically, I shall assume that FCRs ensure the correctness of categories.

Another problem with the approach to case-marking which has been outlined above is that it is too simplistic when morphologically marked items are taken into account. Thus saying that case-marking prepositions are looking for case-free objects rules out partitives such as *some of them* in which *them* clearly has an oblique marking. This means that the specification of the objects of prepositions like *of* needs to be somewhat more subtle than just [−Cm]; however, I shall assume here, in the interests of a concise exposition of the general approach, that the required feature specifications can be stated as shown.

To complete the basic picture by expanding the remaining two rules in (2-11), all that is required is the uncontroversial assumption that the specifier must agree with the noun. However, this is not as simple as at first sight as there

are interesting questions about where the agreement features on the mother come from. This topic was touched upon in the discussion of Selkirk in chapter 1. I shall assume that there are two agreement feature sets on specifiers; one which forces agreement with the 'argument' N1 and another which is passed to the NP. In this sense SpecP is the head of NP in the present account. The relevant part of the lexical entry for *many* will therefore be:

(2-23) *many* [Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms]]

As stated above, *Agr* is a category-valued feature containing specifications for number and mass, and in (2-23) *ArgAgr* takes the same values. This is not always true; the numeral *one*, and the specifiers *each, either* and *neither*, require different values in partitives (an example entry for *one* is provided at the end of this section).

In the lexicon the number and mass features distinguish nouns as follows:

(2-24) [Num sg, −Ms] *book*
[Num pl, +Ms] *books*
[Num sg, +Ms] *wine*

Giving plural nouns a mass feature (ie. [+Ms]) allows them to be paired with singular mass nouns in certain circumstances; for example, in the discussion below of the rules which analyse bare plurals as NPs, a rule which allows mass N1s to be NPs is introduced which covers singular mass and plural count nouns. This is easily stated by referring to the feature which both types of noun have in common; [+Ms]. However, in keeping with common usage, I shall refer to the three types of noun as singular, plural, and mass.

The next assumption is that the specifiers should be made sensitive to the case-marking and definite features on the argument N1s. As suggested in chapter 1, specifiers must agree with nouns in both simple NPs and partitives:

(2-25a) Several men
(2-25b) * Several man
(2-25c) Several of the men
(2-25d) * Several of the man

I propose, in effect, that the mechanism for ensuring this kind of agreement should be extended to enforce agreement with the 'whole' nominal; the N1. This can be implemented by giving separate lexical entries for the specifiers depending on whether their arguments are definite or indefinite N1s. As a result *many* has two lexical entries:

many:
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], ArgCm of, +ArgDef]

It would be possible to group all the argument feature specifications under one complex category-valued feature. However, while this may be a better realisation of the idea that the specifier insists on a specified 'cluster' of features on the N1, the relevant features on nouns must be similarly grouped in order to keep the PS rules simple, and I have decided here not to do this; one disadvantage would be that the lexical entries become difficult to read when they contain nested feature structures, and as it is useful to group the agreement features together, it would be necessary to introduce another level of structure.

The PS rule which handles specifiers, (2-11a), is fully expanded as:

(2-11a')

[NP, Agr $1] →
[SpecP, Agr $1, ArgAgr $2, ArgDef $3, ArgCm $4],
[N1, Agr $2, Def $3, Cm $4]

Here the FP rules should state that the agreement features on the NP must match those on the SpecP, and this can be done as follows:

(2-26) {Agr} [NP, ¯F], @F : [SpecP, ¯F], @F

The rule (2-11a') is thus simplified slightly. Similarly, FP rules can be used to pass all the features on specifiers to the SpecP:

(2-27) {Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [Spec, ¯F], @F

It is not therefore necessary to expand the simple SpecP rule (2-11b), which is repeated below:

(2-11b') SpecP → Spec

Further possibilities for expanding SpecP are suggested in chapter 3. Looking again at the lexical entry for *many* above, it is arguable that it is undesirable to have two separate entries in order to account for partitive and simple NPs. In order to capture the notion that there is basically one representation, the central part of which is the agreement specification, it is possible to use lexical rules (lexical redundancy rules) as developed in Lexical-Functional Grammar (LFG) (Kaplan and Bresnan 1982). This feature is available in the later unification-based versions of PATR (Shieber 1986), as mentioned in the introduction to this chapter, and the D-PATR (Kartunnen 1986) version of the current grammar implements some lexical rules in order to eliminate the redundancy involved in the two entries for *many*. For the moment, I shall continue with the description based on the adapted Phillips formalism in which multiple lexical entries are required, having noted that the underlying assumption is that these can be collapsed if desired. Section 2.3.4. below investigates this topic more fully and supplies examples of lexical rules.

Returning to the NP rule (2-11a') and the lexical entries provided in (2-24), these will provide analyses for NPs like *many books* and *many of the books* while rejecting non-plural N1s and the other two forms of N1 in (2-20); **many*

the books and **many of books*. (Other quantificational elements, such as *all* and *a number*, accept these forms as arguments in, for instance, *all the books* and *a number of books*.) The agreement features on the mother NP, having come from the specifier, will enforce plural agreement with predicates.

As another example, the entry for *one* in the lexicon is:

one:
[Spec, Agr [Num sg, −Ms], ArgAgr [Num sg, −Ms], −ArgCm, −ArgDef]
[Spec, Agr [Num sg, −Ms], ArgAgr [Num pl, +Ms], ArgCm of, +ArgDef]

In this case the argument N1 is indefinite, singular, and un-case-marked, or plural, definite and case-marked. Thus the grammar will generate *one book* and *one of the books*. In both cases, as it is assumed that the specifier is the head as far as agreement is concerned, the NP's agreement features will be singular. The following section discusses further some of the issues involved.

2.3.3. Specifiers as Heads

It is reasonable to ask why the specifier should be chosen as the head when the argument is based on examples like *one*. As mentioned previously, only *each, either* and *neither* seem to have the same relevant distributions as *one* while counter-examples abound; for instance, with the specifiers *all, some,* and *any,* the important features in partitives seem to come from the noun (via N1):

(2-28a)	All the sand	(mass)
(2-28b)	All the people	(plural)
(2-28c)	Some of the wine	(mass)
(2-28d)	Some of the books	(plural)
(2-28e)	Any tables	(plural)
(2-28f)	Any water	(mass)

Note that I have assumed that, for instance, *some of the wine* is a mass NP. This is not clearly the case; the only evidence is that the whole NP exhibits

singular agreement which is equally true, of course, of singular count NPs. The other distributional tests for 'mass-ness' of which I am aware concern the ungrammaticality of NPs formed from mass nouns and the indefinite article (**a water*) and the insistence of the specifiers *much* and *(a) little* on mass nouns. The indefinite article cannot provide a test as the result here would be an unacceptable sequence of specifiers:

(2-29a) * An all the sand
(2-29b) * A some wine
(2-29c) * An any water

As for *much* and *little*, in simple NPs these do seem to select mass nouns:

(2-30a) Much water
(2-30b) * Much man
(2-30c) * Much books
(2-30d) Little wine
(2-30e) * Little women
(2-30f) * Little pencils

In (2-30e) and (2-30f), of course, the adjectival homonym is irrelevant. However, in the kind of example which requires to be classified here, *much* and *little* cannot be used as a test; for one thing, in partitives, both specifiers accept either mass or singular count nouns:

(2-31a) Much of the table
(2-31b) Much of the wine
(2-31c) Little of the book
(2-31d) Little of the sand

Thus the only case in which the specifiers provide evidence is when they appear in simple NPs. The NPs below are therefore irrelevant as well as unacceptable:

(2-32a) * Much of some of the wine
(2-32b) * Much some water
(2-32c) * Much of some wine
(2-32d) * Little much book
(2-32e) * Little of much of the book
(2-32f) * Little of any sand

Discussions about the mass-ness of NPs such as *some of the wine* must therefore be intuitive, or at best based on selectional restrictions and other semantic considerations. My own intuitions are that these NPs are mass, and that this holds of the cases where the mass specifiers form partitives with singular count nouns, such as *much of the window*. One of the main reasons for having two agreement feature sets on specifiers is therefore to allow flexibility in this area while at the same time preserving a general statement of agreement in simple and partitive NPs; the NP's agreement features come from the specifier. This means that some attention has to be paid to cases such as those exemplified in (2-28), repeated below:

(2-33a) All the sand
(2-33b) All the people
(2-33c) Some of the wine
(2-33d) Some of the books
(2-33e) Any tables
(2-33f) Any water

However, these can be accommodated fairly easily by making all the *Num* features in the lexical entry match. Hence, for example, the entry for *all* is:

all:
[Spec, Agr [Num $1, +Ms], ArgAgr [Num $1, +Ms], −ArgCm, −ArgDef]
[Spec, Agr [Num $1, +Ms], ArgAgr [Num $1, Ms $2], ArgCm $3, +ArgDef]

Thus *all* will form simple NPs such as *all women* and *all wine* and partitives with any noun; *all of the women, all of the book, all of the time.* In every case the resulting NP is mass; either singular or plural. Note also that the partitive does not insist on case-marking, and so *all the women, all the book*, and *all the*

time are equally possible.

Some of these NPs seem more natural than others; *all wine* and *all the book*, for instance, are not so easily acceptable as *all the time*. However it is relatively easy to find reasonable contexts and I therefore feel they should be allowed. A more serious problem, perhaps, is that there is no obvious lexical redundancy statement which will relate the simple and partitive entries for *all*. This problem is worth a little consideration.

2.3.4. Expressing Lexical Generalisations

It was proposed above that lexical redundancy rules would serve to generalise across lexical entries such as those suggested for *many*:

many:
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], ArgCm of, +ArgDef]

There are a number of ways in which the required generalisation can be achieved. It was also stated previously that I am assuming a PATR-like version of lexical rules. An example of the use of these is provided in Shieber (1986) in which the following is suggested as a possible implementation of the LFG agentless passive rule:

(2-34) $<out\ subj> = <in\ obj>$
$<out\ obj> = nil$

I have adopted Shieber's notation here. Thus the information between angled brackets represents a feature-value path specification; as Shieber points out, there is an inconsistency in the representations used in that whereas before a category-valued feature was represented as for example [Agr [Num sg, +Ms]], the assumption in lexical rules is that each 'path' is represented separately, and so the latter example would appear as below:

(2-35) <Agr Num sg>
<Agr Ms +>

The additional notation in the lexical rule specifies the 'transformation' which is to be applied to the input category. Thus the values for the features at the end of the path specifications on the *in* category are mapped into the specifications on the *out* category. The rule in (2-34) will therefore perform a transformation on the lexical category which represents a verb (strictly, in this case, on any category which contains the feature *obj*), making the active object the passive subject and the passive object empty. The same kind of operation will allow a single representation of *many* to be transformed into two. In the same format as above, and assuming that the basic entry for *many* is as shown below, the subsequent lexical rule is sufficient:

many:
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]

<out Agr> = <in Agr>
<out Cat> = <in Cat>
<out ArgAgr> = <in ArgAgr>
<out ArgCm> = of
<out ArgDef> = +

It should be noted that some implementations of PATR require the operation of overwriting to produce the correct results in such cases. Overwriting is similar to unification except that in certain cases where unification fails through feature clashes, one of the features is given precedence and its value is forced onto the output category. As Shieber notes, this is an extremely powerful operation which has undesirable effects, one of which is that the order of application of functions becomes important (Shieber 1986, pp.60-62). It is also possible to violate the notion of monotonicity as information is typically deleted by such an operation. In order to avoid this here, it would also be possible to have two lexical rules operating on an underspecified input structure. Hence if

the basic entry for *many* excludes the *ArgCm* and *ArgDef* features, it is possible to have two lexical rules which produce the forms corresponding to the simple and partitive NPs, thus preserving monotonicity.

In order for the rules to apply, it is necessary to mark the lexical entries with suitable features and to make the lexical rules sensitive to these. Let us say, then, that the lexical entries for specifiers include a specification for *Subcat* and so, for example, the underlying representation of *many* becomes:

many:
[Spec, Subcat 1, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms]]

The two lexical rules below will then apply to produce the desired entries:

Simple:

$<out\ Agr> = <in\ Agr>$
$<out\ Cat> = <in\ Cat>$
$<out\ ArgAgr> = <in\ ArgAgr>$
$<out\ ArgCm> = -$
$<out\ ArgDef> = -$
$<in\ Subcat> = 1$

Partitive:

$<out\ Agr> = <in\ Agr>$
$<out\ Cat> = <in\ Cat>$
$<out\ ArgAgr> = <in\ ArgAgr>$
$<out\ ArgCm> = of$
$<out\ ArgDef> = +$
$<in\ Subcat> = 1$

Strictly, the *out* specification should include the *Subcat* value in order to ensure that no information is deleted by the rule. The question of the generality of these rules now arises. As mentioned above, it is not possible to apply the same rules in the case of *all*, and this is true of *one* also. However, before investigating these, it is useful to look at how many of the specifiers which were mentioned in chapter 1 fall into the same category as *many*. The original list is

reproduced below:

> Each, every, any, some, much, either, neither, little, a little, many, few, a few, several, all, a, both, no, none, half

The determiners have been excluded, of course, as they are now assumed to be entirely different syntactic categories. However, the lexical rules given above appear only to apply to *many, few, a few, several,* and *both* out of the seventeen. While this does not look like a particularly useful generalisation at first sight, it should be noted that all the cardinal numerals, apart from *one*, require exactly these rules.

Of the others, three require the simple rule only; *a(n), no* and *every*. (Leaving aside the problem of examples such as *every one of the books* for the moment). This leaves a largish set of items, comprising *each, any, some, much, either, neither, little, a little, all, none*, and *half*. It is useful at this point to construct a table in the spirit of the distributional schema found in Quirk et al., (1972). Thus table II-IV represents the specifiers and their occurrences with singular, plural and mass nouns in simple and partitive NPs.

The specifications in II-IV are exhaustive with respect to the list in chapter 1 apart from the specifiers discussed above which pattern with *many*. Before looking more closely at the actual patterns, it should be noted that I have not included the singular versions of simple NPs formed with *any, some,* or *no* in the table. The reasons for this are mainly semantic, but one syntactic frame which provides evidence for a distinction between, for instance, *any man* and *any men*, is Milsark's strong specifier environment (Milsark 1979). Thus while *any man, some man*, and *no man* are obviously acceptable, they are very difficult to fit into the simple frame below:

	Simple NP			Partitive NP		
	sg	pl	mass	sg	pl	mass
any	−	+	+	+	+	+
all	−	+	+	+	+	+
some	−	+	+	+	+	+
half	−	−	−	+	+	+
none	−	−	−	+	+	+
much	−	−	+	+	−	+
(a) little	−	−	+	+	−	+
either	+	−	−	−	+	−
neither	+	−	−	−	+	−
each	+	−	−	−	+	−
one	+	−	−	−	+	−
no	−	+	+	−	−	−
many	−	+	−	−	+	−

Table II-IV: Distribution of Specifiers

(2-36a) * There is/isn't any man
(2-36b) * There is some man
(2-36c) * There is no man

While combinations with modification following the noun are better, there is a relatively clear contrast with the plural and mass cases:

(2-37a) There isn't any sand
(2-37b) There aren't any people
(2-37c) There is some water
(2-37d) There are some books
(2-37e) There is no wine
(2-37f) There are no answers

This is obviously a rather intricate area, but I think there is enough evidence to conclude that the singular versions should be given separate lexical entries which reflect different semantic, as well as syntactic, properties.

There is also clearly a lot of idiosyncracy in table II.V, although perhaps not as

much as on first sight. For example, on the assumption that *no* and *none* are two halves of the same item, together they pattern in the same way as *any, all,* and *some.* This leaves two more classes of specifier; *much* and *(a) little* on the one hand and *each, either, neither* and *one* on the other. In order to preserve the thesis that there is an underspecified representation which is filled out by redundancy rules, in these cases it is necessary to propose another three sets of rules corresponding to the basic versions proposed above for *many.* Taking *all, some, any,* and *no(ne)* as an example, the required lexical rules would have to operate on the agreement features as well as the definite and case-marking features. The partitive rule would actually be the same as the previous one:

Partitive:

$<out\ Agr> = <in\ Agr>$
$<out\ Cat> = <in\ Cat>$
$<out\ ArgAgr> = <in\ ArgAgr>$
$<out\ ArgCm> = of$
$<out\ ArgDef> = +$
$<in\ Subcat> = 2$

However, a different simple NP lexical rule is necessary which instantiates the value + on the feature *Ms* in *ArgAgr*:

Simple2:

$<out\ Agr> = <in\ Agr>$
$<out\ Cat> = <in\ Cat>$
$<out\ ArgAgr\ ms> = +$
$<out\ ArgAgr\ num> = <in\ ArgAgr\ num>$
$<out\ ArgCm> = of$
$<out\ ArgDef> = +$
$<in\ Subcat> = 2$

A possible lexical entry for *some* would therefore be:

some:
[Spec, Subcat 2, Agr [Num $1, Ms $2], ArgAgr [Num $1, Ms $2]]

Similar transformations could be applied to produce suitable representations for the other classes (*each/one* and *much/(a) little*). However, at this point, I feel it is useful to leave the details aside and concentrate on the overall picture of the relationship between simple and partitive NPs. From now on lexical entries will normally be given with multiple representations for simple, partitive and pseudopartitive forms as it is usually simpler to present the relevant details. The following section recalls some of the issues which were raised in chapter 1 and relates them to the latter suggestions.

2.4. Partitives without PPs

It has been suggested on quite a few occasions above that *of the students* in NPs such as *some of the students* is better treated as a nominal than as a PP. Section 2.4.2 below looks at some arguments which can be adduced to distinguish the constructions in question from PPs; firstly, however, some general points are made about the assumption that contrastive distribution provides the basis for ruling out various ill-formed structures which pose problems for more traditional accounts of partitives.

2.4.1. Contrastive Distribution

In introducing the notion of partitives as simple NPs in section 2.2. above, it was suggested that the notion of contrastive distribution would play a role. This is a traditional linguistic restriction which states that in a given structure certain categories can only have one occurrence. As far as I know, it is usually a syntactic constraint. Note, however, that Jackendoff (1977) suggests a semantic version; he stipulates that more than one specifier can appear in an NP but rules out certain combinations with the specifier constraint, which is reproduced below:

(2-38) An NP specifier may contain at most one demonstrative, one quantifier, and one numeral.

In the present grammar, following the usual assumptions in GPSG-type formalisms, it is assumed that the match between syntactic and semantic rules should be as close as possible. Cross-categorisations such as Jackendoff's, in which the semantic classes do not match the syntactic classes, are therefore to be avoided. The advantage in the present context is that assuming syntactic contrastive distribution will account for Jackendoff's semantic restriction.

The rules for adding determiners and case-marking which were introduced above in (2-11d′) and (2-11c′) embody contrastive distribution in that they cannot apply to their own output. The situation with the specifier rule in (2-11a′) is effectively the same although the restriction is imposed by bar level. These restrictions in themselves are commonplace, of course, but the important point is that by treating simple NPs and partitives as the same kind of structure, the constraint applies to both with no further restrictions being necessary. Thus the partitive constraint is built-in; just as it is not possible to form NPs such as **many some men*, partitives like **many of some men* are not generated. Similarly, the problem of ruling out partitives such as **the of the men* does not arise. (This kind of over-generation is not discussed by Selkirk (1977), although it seems that the grammar she describes will allow such NPs. Jackendoff (1977) and Barwise and Cooper (1981) explicitly mark specifiers with an appropriate feature, which gets the correct result by fiat.) In the semantics, the problem of explaining how specifiers can appear in two distinct syntactic environments (with common nouns and PPs) also does not arise; the specifiers take the sets denoted by N1s as arguments in both partitive and simple NPs. As I shall show below, all that is required in the semantics is a strategy for identifying the referent of the definite N1 (chapters 4 and 5). However, before looking at these strategies, the question of whether or not partitives contain full

PPs must be addressed.

2.4.2. Case-Marked Nominals and PPs

The view that some prepositions indicate case-marking is very common; this assumption is very important in Case Grammars such as those based on the work of Fillmore (for example Fillmore 1967). Stockwell et al. (1973) also make use of the notion and introduce a fairly extensive system of defaults and frames for expressing various case roles. However, my proposals differ in assuming that what is case-marked is a non-maximal projection of N rather than a full NP. Thus where it could happily be argued in Stockwell et al.'s grammar that the case-marking prepositions are still in full prepositional phrases, I am claiming that partitives are different. It is not therefore the question of whether or not these structures are called 'case-marked' that is at issue, but the more important question of what grounds there are for distinguishing them from PPs.

There is one obvious set of data which distinguishes the partitive constructions from PPs which lies at the root of the present thesis. Viewed from a theory neutral position, it must be accepted that it is highly unusual for the NP within a PP to be restricted in its choice of specifier/determiner. Hence the PPs below are perfectly well-formed:

(2-39a) A girl in every port
(2-39b) An idea from many sources
(2-39c) A painting by some local children

The partitive constraint was assumed, as we have seen, in order to rule out quantified NPs such as *every port, many sources* and *some children* appearing in partitive PPs. As far as I know, there is no comparable restriction on any other PP. Related to this, there is the more formal problem that in a treatment of

partitives which analyses the *of*-phrase as a PP, it is necessary to pass a feature to the top node which specifies whether or not the NP inside the PP is definite. This is a very unusual requirement on PPs.

Other evidence concerns the kind of movement which appears in cases such as *of the students, many were English.* It will be argued below that these constructions also serve to classify the items which form pseudopartitives, but the later discussion is largely orthogonal to the present issue. The point here is that PPs which modify nouns cannot be fronted in this way:

(2-40a) * From London, the man was angry
(2-40b) * With long red hair, a girl bought a ticket
(2-40c) * For cleaning windows, the cloth was lost

One immediate question here is why these examples should be relevant; the structure I have proposed for partitives does not constitute a noun with a following modifier. The answer is that the data in (2-40) can be taken to show firstly that the analysis of partitives as structures containing an empty head noun has problems. This in turn means that the putative PP in *some of the students* is unusual in that PPs typically modify verbs and nouns (assuming sentence-level adverbial PPs are verbal modifiers). Thus either the PP is modifying a noun and can be moved, which is unusual, or it is not modifying a noun or a verb, which is also very unusual.

Another piece of evidence concerns coordination. Note firstly that it is possible to have sentences such as *some in my class are clever.* However, this kind of modifier can never be conjoined with the partitive *of* phrase:

(2-41) * Some of the students and in my class are clever

It is of course possible to conjoin PPs, and *of* phrases, in many cases:

(2-42a) People in my area and of my age group are few
(2-42b) ? Many of the students and of the teachers were annoyed

However it must be accepted that this is weak evidence; many PPs cannot be conjoined and the argument also assumes that the specifier which appears in *some in my class* and *some of my friends* is being used in the same way. It could also be argued, generally, that case-marking uses of prepositions are unlikely to be conjoined freely.

It was mentioned in chapter 1 that it may be possible to strand partitive *of* in cases where pied piping can apply:

(2-43) ?? Which students have you seen some of?

However, this is a very marked construction, and is probably only possible in strongly echoic contexts. With PPs, on the other hand, this kind of stranding is very common:

(2-44a) Which table did you put the book on?
(2-44b) Which town does he come from?
(2-44c) Which hill did you walk over?

Note that this is also possible when the PP is expressing a case role:

(2-45a) Which man were you insulted by?
(2-45b) Which student did you give the book to?

Apparently, other uses of *of* can also be stranded quite easily:

(2-46a) Which ones did you give examples of?
(2-46b) Which country is he king of?
(2-46c) What did you make it of?

The suggestion is therefore that the distinctions are explained by the fact that the partitive phrase is a case-marked N1 rather than a prepositional phrase. In general, this is clearly an intricate area, and it may be that my assumption of a non-maximal treatment of constituents like *the students* is more important, and

more easily discussed, than the prepositional nature of the partitive phrase. The following section examines this topic briefly.

2.4.3. Non-Maximal Nominals

It seems that there is little to choose between an account which has a rule such as **NP → Det N** and another which has two rules **N1 → Det N1** and **NP → N1**, given that the latter rule will be necessary anyway in the first account in order to analyse bare plurals. I should note that the non-maximal analysis is not unique; Ladusaw, for example, suggested a comparable account in which he argues that the definite articles and the demonstratives can be treated, syntactically and semantically, as adjectives (Ladusaw 1985). For the moment the point is that a reasonably straightforward match between syntax and semantics is still possible if definite nominals are analysed in the same way as adjectives in rules of the general form **N1→ X N1**. One possible criticism of this approach which is mentioned by Ladusaw is that such rules can apply to their own output and 'stack' adjectives in the usual manner (p.175). This is clearly not true of the determiners in English. However, Ladusaw suggests some solutions to this problem (p.175), one being that it is almost certainly to order adjectives in any case (given examples such as ??*red large books* and *large red books*). It would therefore be straightforward to insist that the determiner appears before other adjectives. It is also worth noting that some languages do have what appear to be multiple occurrences of demonstratives, for example a Hungarian NP can contain the equivalent of *the this man*, and so there may be no reason to exclude sequences on principle. As argued above in section 2.4.1., I have assumed that contrastive distribution is the restricting factor in English, and this is formalised using binary features on the nominal complexes. Ladusaw also notes that a common treatment of simple, partitive and pseudopartitive NPs may be possible if his approach is accepted (p.174). I have

attempted to show here that this notion is desirable as well as possible.

The introductory sections to this chapter discussed data from Old English and suggested that one feature of my account was its compatibility with other languages. The following section makes some brief remarks about French and Italian partitives to show how they might be incorporated and to supply more evidence for the general approach.

2.4.3.1. The French Partitive Clitic

Extensive studies of the French clitic *en* are available, notably in Milner (1978) and more recently in Elliott (1986). Milner's account is particularly detailed, and it would require more work than is justifiable here to refute some of his arguments. I shall therefore merely point to the areas of disagreement and note that the suggestions below are intended only to sketch an account which is compatible with the English NP grammar which is being developed here. The main point is that the existence of the French clitic *en* (and similar cases such as Italian *ne*) can be interpreted as evidence for a nominal account of partitive phrases. Some Italian examples are provided at the end of this section; the basic French data are shown below:[4]

(2-47a) Je connais beaucoup des hommes
I know plenty of the men

(2-47b) J'ai beaucoup du pain
I have plenty of bread

In parallel with these fairly straightforward partitives, there are cases where the clitic *en* expresses the partitive phrase:

---

[4] Although a more accurate rendering of *beaucoup* would perhaps have been as *much* or *many*, I have translated it here using *plenty*. This is partly to allow a single translation for mass and count uses and partly because it also allows a direct translation of pseudopartitives. Also note that the French and Italian examples are given fairly free translations; thanks to the relatively close relationship between English and these languages, it should be clear how each word is being represented.

(2-48) J'en ai beaucoup
I have plenty of them/it

And finally, there are cases where the clitic stands for the relevant common noun rather than the partitive phrase (Milner 1978, p.28):

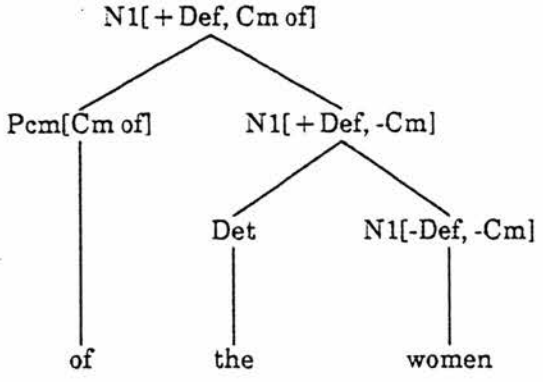
(2-49) Avez-vous un crayon? – j'en ai un
Do you have a pencil? - I have one

The two uses of *en* mean that certain sentences are ambiguous, and Milner provides the following example:

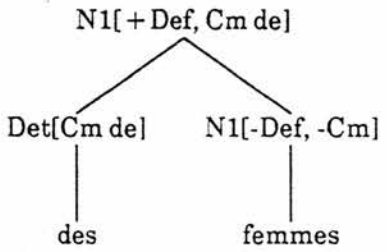
(2-50) Ils ont attrapé dix lions mardi; mercredi ils en ont tué cinq
They caught ten lions on Tuesday; on Wednesday they killed five of them

The last example, (2-50), could mean either that five of the lions which were caught were killed or that another five were killed. Generally, it is not difficult to analyse the data in (2-47) - (2-49) in the spirit of the SIP grammar; the main complication is the fact that French *des* appears to have assimilated the definite article. Milner assumes the standard account in which *de* + *les* → *des* (p.37). To handle this in the SIP grammar, we need only allow the 'fused' element to contain both the definiteness and case-marking features. Thus the English partitive phrase in (2-19) above is directly comparable with the French version in (2-51):

(2-19)



(2-51)



As in the English example, there is no need to state the definiteness feature on the determiner as all these items are now assumed to be definite. The rule for English in (2-11d'') above can be duplicated in order to handle the French case-marking determiners. The clitic can now stand for a nominal in all cases. This contrasts with Milner's analysis in which he suggests two classifications for *en* which he terms 'quantitatif' and 'génitif' (quantitative and genitive). In order to preserve the unary account, which I suggest is to be preferred in principle, a few points should be made about Milner's proposals. Firstly, he assumes that *des* can be the plural indefinite article in French as well as the fusion of *de les*. This explains the possible cases in which *des* is used with an indefinite interpretation. An example of this which Milner provides is:

(2-52) Avez-vous des crayons?
Do you have (any) pencils?

However, it could be argued that this possibility is related to a general tendency in French in which the definite article does not necessarily mark definiteness. Thus *j'aime les femmes* can mean *I like women*. One way to handle this is to say that the syntactic feature [+Def] in French need not indicate that the nominal is semantically definite. In this way *des* can be given a single treatment.

The main evidence on which Milner bases the distinction between quantitative and genitive *en* comes from sentences such as the following:

(2-53a) * Des pommes, deux en sont gâté
Of apples, two of them are bad

(2-53b) Ces pommes, deux en sont gâté
These apples, two of them are bad

In (2-53a) *en* is quantitative in Milner's terms, while in (2-53b) it is genitive. Most of the data which Milner adduces concern similar dislocations, and in each case the quantitative *en* does not allow the movement. As we shall see shortly, similar strictures apply in English, and the data could be interpreted as strong evidence for refuting the unified analysis of English partitives and pseudopartitives which was suggested above. My claim is that most of the problems can be explained by the fact that definiteness is the crucial factor. An attempt will be made in later chapters to characterise what exactly is meant by the term; for the moment, I assume that definiteness in the moved constituent is the property which accounts for Milner's data and not the proposed distinction between quantitative and genitive *en*. As for the notion that *en* when it expresses a partitive phrase is pronominal, Milner himself notes that this is the case:

> *En* partitif se comporte donc pour l'essential comme un pronom anaphorique ordinaire (p.70).
>
> 'Partitive *en* thus behaves essentially like an ordinary anaphoric pronoun'

A few brief remarks on the clitic *ne* in Italian may also be pertinent in reinforcing the general pronominal approach. Firstly, *ne* behaves in many respects in the same way as *en*:[5]

(2-54a) Due amici comprarono tre case
Two friends bought three houses

(2-54b) Due amici ne comprarono tre
Two friends bought three of them

---

[5] Many thanks to Antonio Sanfilippo for the Italian data.

Again, a fairly straightforward account of the syntax of *ne* is possible if it is pronominal in all cases. However, there is further direct evidence in Italian that the cognate of the English *of* phrases are nominal in pseudopartitives. Thus it is possible in Italian to conjoin a simple NP with an *of* phrase:

(2-55) Ho visitato un caro amico e dei parenti che non vedevo da secoli
I visited a dear friend and (PART) relatives whom I have not seen in ages

It is also possible to form PPs with *of* phrases:

(2-56) Ho telefonato a degli amici che non vedevo da secoli
I telephoned to (PART) friends whom I have not seen in ages

None of these data, of course, argue directly for the analysis of English which I have proposed. However I suggest that the French and Italian data lend support to the general view that the *of* phrases have nominal properties and that, while these properties are less immediately obvious in English, they are central to a satisfactory account of the construction.

2.4.3.2. Some Counterexamples

One problem with the analysis of partitive phrases as nominals is that a straightforward account of coordination would predict that they should conjoin with other N1s. This is clearly not the case in English:

(2-57a) * I saw some students and of the professors
(2-57b) * I met each of the team and sponsor
(2-57c) * I talked with all members and the husbands

It was mentioned above in the discussion of Milner that many of his data could be explained if definiteness was assumed to be the crucial property. In the discussion of pseudopartitives in the following chapter a number of arguments are presented which depend on data such as:

(2-58a) * Of students in my class, many are from London
(2-58b) Of the students in my class, many are from London

It will suffice here to note that, once again, a straightforward analysis of *of*-phrases as N1s might predict that constructions such as (2-58a) are well-formed if (2-58b) is. I propose, therefore, that these movements and coordinations are sensitive to the presence or absence of definiteness in the relevant constituent. Thus definiteness features must match in N1 conjuncts and fronted N1s must be definite. These informal restrictions will account for French data such as those in (2-53) above.

2.5. Summary

It has been proposed in this chapter that, following the arguments advanced in chapter 1, there are no grounds for suggesting radically different structures for partitive and simple NPs. The analysis provided above distinguishes the NPs purely on the grounds of the (syntactic) features which are required by the quantifying elements to be present on their arguments. In chapter 3 an account of NPs which appear to have more than one specifier is provided and an analysis of pseudopartitives is developed. To conclude this chapter, I shall look again at the NP problems which Jackendoff's grammar addresses and compare the solutions proposed so far.

There were four main points about the syntax of NPs which Jackendoff's account explains. The first concerns allowed sequences of specifiers in simple NPs, and this will be addressed in the following chapter. The other three relate to constraints on sequences of specifiers in simple and partitive NPs, and as was pointed out in chapter 1, Jackendoff uses a range of mechanisms to deal with the restrictions. In all, the specifier constraint, the partitive constraint, different syntactic and semantic classes of specifier, and a separate classification

of specifiers depending on whether or not they license partitives were used. Nearly all the problems have been handled in this chapter by assuming what is essentially an extension of the specifier constraint, i.e, contrastive distribution, and by the classifications of specifiers.

One final point is worthy of note. As we shall see shortly, the account of pseudopartitives in the present framework is straightforward, and means that the operation of the word *of* is uniform in all these cases; it is a case-marker. This contrasts with the analyses of Selkirk and Eguren which were discussed in chapter 1; both of them posit two *ofs* in order to explain the facts. Note also that Milner employs two versions of *en* which implies, in turn, two classifications for *de* in French. I suggest that this multiplication of category specifications is evidence that the analyses concerned are missing generalisations.

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Chapter 3

Extending the Grammar

3.1. Introduction

Chapter 2 provided an analysis of simple NPs and partitives in which the fundamental structural relationships are identical; both types of NP contain a specifier with an N1 argument. This chapter begins by tackling two important issues which came up in the previous discussions. Firstly, the problem of how to account for the cases where more than one specifier appears in an NP is addressed. This topic is discussed with specific reference to an unpublished paper by Klein (1980). Secondly, an account of pseudopartitives is proposed which minimises the distinction between these and the two types of NP which were analysed in chapter 2. To conclude the range of data covered by the grammar, an analysis is provided of NPs such as *every one of the men*. Some general points are then made about the grammar and in conclusion comparisons are drawn with the account of the structure of partitives which appears in Grover et al. (1989).

3.2. Sequences of Specifiers

One of the main justifications for Jackendoff's use of a three-tiered NP structure was that it allows for two specifier slots. Thus the NPs below are handled (cf. Jackendoff 1977, p.104):

(3-1a) Fred's many apples
(3-1b) The few problems
(3-1c) Those several issues

Jackendoff assumes that there is no semantic reason why **Fred's some apples*

should be distinguished from (3-1a). This section will investigate these issues in detail in the light of the notion that some specifiers, notably *many* and *few*, have an adjectival feature. As a result of the arguments below the lexical entries given previously for these items must be changed.

3.2.1. Adjectival Specifiers

The suggestion is that the specifiers in (3-1), and also to varying degrees *several*, *much* and *little*, have properties characteristic of both specifiers and adjectives. Relevant data can be found in Klein (1980), in which it is noted that the items in question have the following properties in common with adjectives:

A. They appear after determiners:

(3-2a) His many mistakes are legendary
(3-2b) The few imperfections were ignored

B. They appear in predicate position:

(3-3a) Malcolm's idiocies are many
(3-3b) Nazi philanthropists are few

C. They have comparative forms:

(3-4a) More people were arriving
(3-4b) Fewer people were leaving
(3-4c) She got the most prizes
(3-4d) He had the fewest mistakes

D. They take intensifiers:

(3-5a) Very many mistakes have been made
(3-5b) Rather few people turned up

Klein also argues that conjunction with prenominal adjectives is possible, and that *many* and *few* can also be preceded by such adjectives (1980, p5):

(3-6a) The many and glorious achievements of the people's revolution
(3-6b) The remaining few survivors were hungry

The latter property is highly restricted, but the evidence of A–D above certainly suggests an adjectival feature and sets these words apart from the majority of specifiers which cannot appear in any of the environments in question:

(3-7a) * The any men
(3-7b) * The mistakes were every
(3-7c) * The some-er people
(3-7d) * The very no water

On the other hand, it seems that *many* and the other items in question here can also act very much like the classical quantifiers:

(3-8a) Many words were written
(3-8b) Few ideas were in evidence

While the latter syntactic context is one in which adjectives also appear (*harsh words were spoken*), unlike adjectives, they also appear in partitives:

(3-9a) Many of the people were dancing
(3-9b) Few of the players were talented
(3-9c) * Red of the books was spoiled
(3-9d) * Small of the boys was tired

When these items appear in specifier positions, they still take intensifiers:

(3-10a) Very many politicians are untrustworthy
(3-10b) Rather few Democrats were elected
(3-10c) So many of the animals were infected
(3-10d) Very few of the ideas were sensible

Again, this is uncharacteristic of the classical quantifiers:

(3-11a) * Very some people were there
(3-11b) * Rather every man likes him

It must be accepted that, while this evidence may suggest that the behaviour of *many* and *few* can be explained due to an adjectival feature, the distribution of the other items which can appear in double specifier constructions is much more

restricted. Thus, for example, *several* only seems to follow determiners, and no other positions in common with the rest:

(3-12a) The several problems
(3-12b) * His mistakes were several
(3-12c) * Several-er men
(3-12d) * Very several people

Perhaps the best that can be done here is to suggest that the evidence of *many* and *few* is enough to posit the class of specifier/adjectives, and given its existence, the others may be accepted as defective members. Other ill-formed NPs such as **the much men* (noted by Jackendoff; see chapter 2) will also be allowed.

3.2.2. A Feature-Based Analysis

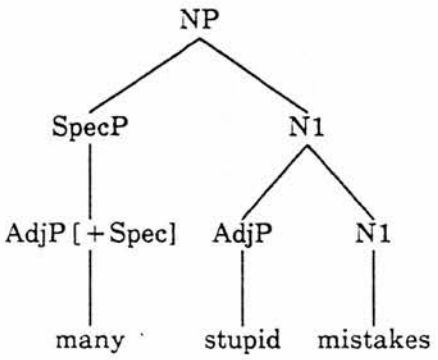
Klein's answer to the above data is to analyse *many* and *few* as adjectives and to add the feature [±Quant] to the categorial definition. In the syntax he introduces a new possibility by expanding his DetN to AP[+Quant]. This suggestion can be accommodated straightforwardly in the present grammar by substituting SpecP for DetN. Little depends on the nomenclature, although it might be misleading to use DetN to label a node which does not dominate determiners. Also, in order do make the lexical entries a little more consistent, I shall use [Spec] in place of Klein's [Quant]; note that, given the distinct syntactic classification which I am suggesting for the demonstratives, the remaining specifiers all operate semantically as quantifiers. The feature [Spec] can therefore be taken to represent a syntactic class which consists of semantic quantifiers. SpecP will now dominate the classical quantifiers and the phrasal category AdjP, and the [Spec] feature must be passed from adjectives to the maximal projection. The new SpecP rule is presented in (3-13) below followed by an analysis of the NP *many stupid mistakes* using the rule (I am assuming

that FP rules do most of the feature passing from the AdjP to the SpecP):

(3-13)

SpecP → [AdjP, +Spec]

(3-14)



As Klein points out, an attempt to give two categories to *many* and *few* must explain why their use as SpecP allows intensifiers, as in (3-10a) and (3-10b) above. However, if they are always adjectival, then these data are to be expected. It should be noted here that the approach which is sketched above needs to be modified as further data is taken into account; however, rule (3-13) provides part of the basis for the account.

There is an immediate problem with the AdjP analysis of *many* and *few*. Klein's account, as it stands, allows for two analyses of *many boys*; one in which *many* is an AdjP dominated by SpecP, and one in which the AdjP appears in its normal position. A related problem is that there is no obvious way to block analyses of ill-formed strings such as *some many students* in which *many* is in a standard adjective position. These problems are discussed in depth in section 3.2.3. below.

Another, more general, question which could be asked of this analysis concerns the distinction between restrictive and non-restrictive uses of adjectives. Thus in a context where a red and a yellow book have been mentioned, it is possible to use *red* restrictively to pick out a particular book. It is also possible to use it

non-restrictively to characterise a feature of the book which has not previously been mentioned, as in a discourse like:

(3-15) The new secrets novel was published yesterday. The red, garishly-bound book is guaranteed sales of over two million.

These uses are usually a little literary in style, but reasonably common. The problem for the analysis of *many* and *few* is that their use as prenominal adjectives is always non-restrictive. Thus it is not probable that two sets of mistakes will be distinguished by the use of an NP like *the many mistakes*:

(3-16) John made many mistakes in mathematics and few mistakes in logic. The many mistakes were due to carelessness.

Such discourses seem highly unlikely, and in the sections below which investigate semantics more fully, an attempt will be made to account for this apparent anomaly. Firstly, however, the problem of multiple parses of *many men* is investigated.

3.2.3. Bare Plurals

Many of the issues concerning bare plurals are discussed in Carlson (1977) and Link (1986b). Some suggestions are made on the topic with reference to the semantics of NPs in chapter 5; for the moment, a few points must be noted about the general properties of bare plurals in order to set the discussion of the multiple parses of *many men* in context. In any NP grammar, it is necessary to have unary rules of the form **NP → N1** in order to analyse, for instance, the subjects of sentences like *birds have wings*. In the present grammar, this rule is being extended to cover singular and plural definite N1s also, the argument being that these have much in common with the bare plurals. The current grammar contains two such unary rules:

(3-17a)

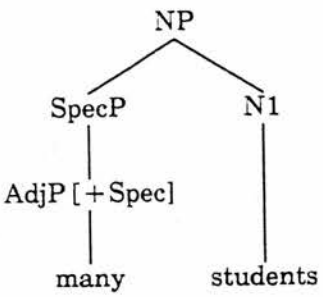
[NP, Agr [Num $1, +Ms]] →
[N1, −Cm, −Def, Agr [Num $1, +Ms]]

(3-17b)

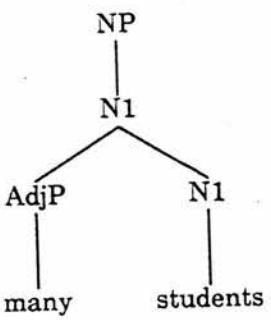
[NP, Agr $1] →
[N1, −Cm, +Def, Agr $1]

The first rule will analyse both singular and plural mass N1s as NPs; hence *elephants have trunks* and *water is now undrinkable* are possible. The second allows any definite N1 to be an NP. Klein's grammar will need a rule like (3-17a), and the problem then is that the following analyses are both possible for *many students*:

(3-18a)



(3-18b)



Another problem, as mentioned above, is that NPs such as *some many students* will be allowed with *many students* as an N1 with the analysis in (3-18b). An answer to these difficulties is to pass the [Spec] feature from the AdjP to the N1 and use this to rule out the unwanted analyses. This can quite straightforwardly be achieved by amending the adjective and specifier rules, and the first **NP → N1** rule, as follows:

(3-19a)

[N1, −Cm, −Def, Spec $1] →
[AdjP, Spec $1],
[N1, −Cm, −Def, −Spec]

(3-19b)

NP →
[SpecP, ArgAgr $1, ArgDef $2, ArgCm $3],
[N1, Agr $1, Def $2, Cm $3, −Spec]

(3-19c)

[NP, Agr [Num pl, +Ms]] →
[N1, −Cm, −Def, Agr [Num pl, +Ms], −Spec]

These rules too will need some modification, as we shall see below; however, notice that the adjective rule (3-19a) will not allow adjectives to modify definite, case-marked, or 'quantified' N1s, thus ruling out **red the politician, *small of boys*, and **clever many students.*[1] The NP rule (3-19b), is now looking for an N1 with the feature [−Spec]. Thus *several few people* is impossible, and the unary rule (3-19c) will not parse *few problems*, leaving only the analysis in which *few* is a SpecP. The use of the [Spec] feature is not particularly satisfying, and should be interpreted as shorthand for a semantic restriction. Klein argues that *many* and *few* denote vague numerical predicates of sets. Predicates of sets are typically specifiers, and so if only one quantification is allowed in an NP, there are grounds for ruling out all the ill-formed examples. The suggestion here is that the predication can come from both the specifier rule and the adjective rule. Notice that words like *numerous* and *countless*, which appear to be adjectives, are not possible with specifiers and may also require the [+Spec] feature:

---

[1] Note also that this restriction will rule out examples such as Klein's *remaining few survivors*. As I stated when introducing this example, this kind of modification is highly restricted; seemingly the only acceptable instances contain *few*. It is very difficult to construct similar examples with any of the other adjectival specifiers:

(A) * The remaining many people
(B) * The remaining little wine

Some further remarks are made on this topic in the section on double specifiers in partitives below.

(3-20a) * Some numerous students
(3-20b) * A few numerous problems
(3-20c) * Many countless stars
(3-20d) * Several countless questions

Given the restriction on bare plurals which has just been introduced, it will also be necessary to analyse *numerous* in *numerous students* as a SpecP, which leads to a final point about the specifier rule. Note firstly that, unlike most adjectives, the numerical adjectives *numerous* and *countless* require plural nouns: **numerous book* and **countless computer* are ill-formed and the only possible counter-examples contain collective nouns, for example *?his numerous family*. It seems likely that adjectives such as *ample* represent the mass correlates; *an ample person* and *ample people* cannot easily be interpreted in the same sense as *ample water*. This property is to be expected in an analysis which gives these words a quantificational role as it is possible to insist on certain features on the argument N1s. Thus suitable lexical entries for *many* and *numerous* are:

many:
[Adj, +Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]
[Adj, +Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], ArgCm of, +ArgDef]

numerous:
[Adj, +Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]

The entry given for *many* in chapter 2 was:

many:
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgCm, −ArgDef]
[Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], ArgCm of, +ArgDef]

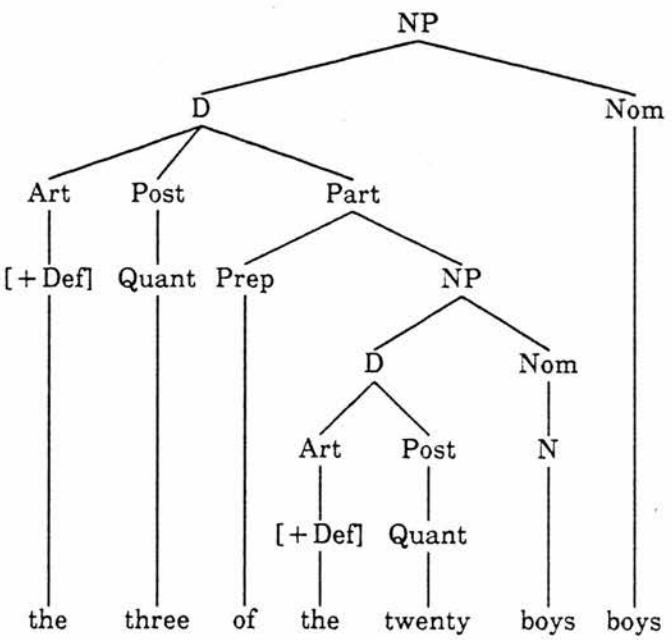
The difference is therefore simply that *many* is now an adjective with a quantificational feature rather than a straightforward specifier. Assuming syntactic rules as before, the above entries for *many* and *numerous* will allow *many men, the many women, many of the people, numerous students, the*

numerous problems and so on, as well as explaining the distribution of intensifiers in such as *very many problems, the very few students,* and **very some men.* However, the following section introduces some data which is related but which is not handled by the grammar as it stands.

3.2.4. Double Specifiers in Partitives

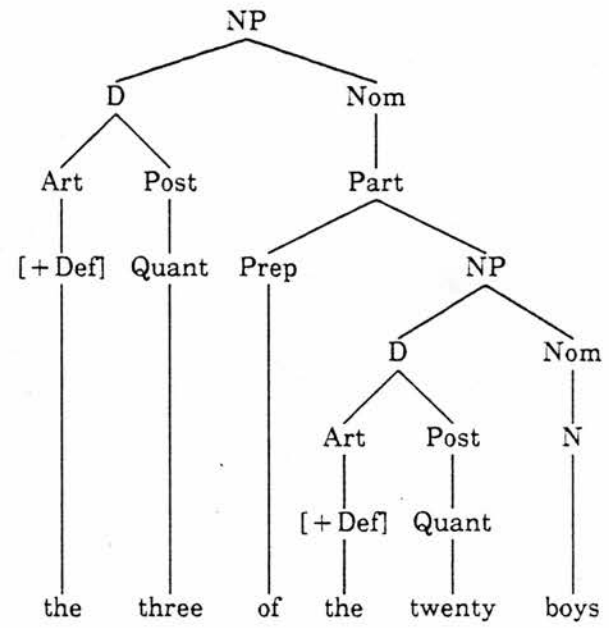
In parallel with the simple NPs which contain two specifiers, such as *the few students*, there are partitives such as *the few of the students.* These NPs are not discussed in Klein's grammar nor, as we shall see, in the analysis which Grover et al. (1989) suggest for the double specifier constructions (which is largely based on Klein's). It might be argued that these NPs provide evidence for having two NP nodes in partitives; Stockwell et al., for instance, can apparently account for these easily, and their approach to the structure of NPs like *the three of the twenty boys* is as sketched below as background to the present discussion. They suggest the following deep structure (cf. Stockwell et al. 1973, p.117):

(3-21)



This will be transformed eventually into the surface structure below:

(3-22)



The matrix definite article is optional; the analysis of *three of the boys* is the same except that the empty indefinite determiner appears under Art in the top NP. There is no need to go into the details of these structures; the point to note is that the structure of NPs such as *few of the men* is identical to *the few of the men*. As mentioned in chapter 1, Stockwell et al. are assuming that there are two NPs in partitives, the first of which contains a noun which is deleted during the transformational derivation, and this allows them to provide a straightforward analysis for the NPs such as *the few of the many men*. One justification for the two NP nodes concerns the possible attachments of relative clauses, and this data will now be examined.

Stockwell et al. argue (following an unpublished paper by Dean) that the assumption of two NPs in partitives means that a restrictive relative clause (RRel) in these structures can modify either NP. Unfortunately, no data or argumentation are supplied at this point, so it is not clear how this suggestion is supported. Stockwell et al. do point out that non-restrictive relative clauses

(NRRel) can cause ambiguities, and the relevant data are provided by sentences like (p.116):

(3-23) I bought a dozen of the eggs, two of which were cracked

It is clear that the NRRel here can modify either all the eggs which are being talked about or the subset which were bought. However, as was noted in the discussion of Selkirk in chapter 1, it is possible to have NRRel modifiers in similar examples which do not contain partitives and which exhibit the same ambiguity:

(3-24a) I bought a dozen eggs, a number of which may contain Listeria
(3-24b) She bought dozens of daffodils, which look nice on the table
(3-24c) He wrote a lot of linguistics textbooks, several of which make good bed-time stories (cf. chapter 1, section 1.2.5.7.)

It cannot therefore be concluded that the ambiguity in (3-23) is evidence for two NP nodes unless NPs such as *a dozen eggs* and *a lot of books* also contain two NPs. On the subject of RRels, however, Stockwell et al.'s argument must be that the following sentence is ambiguous:

(3-25) Few of the men who left were sober

However, it does not seem to be possible to interpret the relative clause in (3-25) as a restrictive modifier of the top NP node; it can certainly modify the whole NP, but in this case it is only interpretable non-restrictively. Stockwell et al. note that some of Dean's arguments on this topic may be inconclusive (p.120), but as mentioned above they do not actually investigate these issues further. I suggest that there are further data which bear on this point which argue against the structures proposed above. Firstly, note the semantic contrasts between the sentences below:

(3-26a) Few borrowers who have large mortgages are happy
(3-26b) The few borrowers who have large mortgages are happy
(3-26c) Few of the borrowers who have large mortgages are happy
(3-26d) The few of the borrowers who have large mortgages are happy

To supply a loose account of the semantics of these sentences, I shall assume a version of the account of quantification provided in van Eijck (1985) which is discussed in chapter 5. All that need concern us here is the assumption that a representation such as *many(x,y)* specifies a relationship between two sets, the first representing the common noun denotation and the second the relevant subset. Assuming further that variable binding is implicit, a rough translation of (3-26) would be:

(3-27) borrowers(x) & large-mortgages(x) & few(x,y) & happy(y)

To paraphrase this representation, it states that, of the set of borrowers who have large mortgages, few are happy. This can be contrasted with a similar translation of (3-26b):

(3-28) borrowers(x) & few(x,y) & large-mortgages(y) & happy(y)

This can be paraphrased as making the entirely different statement that there is a subset of borrowers, and this subset have large mortgages and are happy. The difference clearly lies in the choice of set to which the predicate *large-mortgages* is applied. Note also that an interesting point about the translation of (3-26b) is that the definite article is not represented; this point will be discussed below. Firstly, however, it seems clear that the partitive versions of these sentences, represented by (3-26c) and (3-26d), have parallel semantics. The following is a representation of (3-26c):

(3-29) borrowers(x) & definite(x) & large-mortgages(x) & few(x,y) & happy(y)

The only distinction between (3-29) and (3-27) is that the 'larger' set is now

specified as being definite. Thus a reasonable paraphrase would be that there is a particular set of borrowers in question who have large mortgages, and few of them are happy. Finally, the translation of (3-26d) parallels (3-28):

(3-30) borrowers(x) & definite(x) & few(x,y) & large-mortgages(y) & happy(y)

This time the translation states that there is a particular set of borrowers, a subset of whom have large mortgages and are happy. One again there is a clear distinction between (3-30) and (3-29) in that different sets appear as arguments to *large-mortgages* and also the initial definite article in (3-26d) is not present in the translation in (3-30) although, as we shall see shortly, it is arguable that it actually does need to be represented. The immediate question, however, is whether or not these facts are predicted by a syntactic structure such as (3-21) (or (3-22)). It is clear that Stockwell et al. assume that the only difference between (3-26c) and (3-26d) is in the definiteness or otherwise of the whole NP, and as we have seen the distinction appears to be more radical. Note also the following contrasts, in which the (b) sentences are (semi-)English paraphrases of the (a) versions:

(3-31a) Many men who have bad teeth are British
(3-31b) Men who have bad teeth are many and British

(3-32a) The many men who have bad teeth are British
(3-32b) The men who have bad teeth are many and British

While (3-32b) is an acceptable alternative to (3-32a), this is not true of the sentences in (3-31). This emphasises the fact that the scope of the specifier/adjective in these examples varies; in (3-31a) the quantification is over the noun and relative clause together, while in (3-32a) *many* only scopes over the noun. This is clearly not predicted in Stockwell et al.'s account. However, to be fair to their analysis, they do point out that when two relative clauses are present the first can come within the scope of the specifier/adjective:

(3-33) The many men who have bad teeth who worry are British

It is possible in (3-33) for the relative clause *who have bad teeth* to be within the scope of *many*, in which case the sentence means that, of the set of men who have bad teeth, many worry and are British; the other interpretation is that many men have bad teeth, worry, and are British. What (3-33) cannot mean, apparently, is that many of the men who have bad teeth and who worry are British; this interpretation would require *many* to scope over both relative clauses.

It is not clear how to handle the latter data and ensure, in effect, that the last relative clause in such NPs lies outside the scope of the specifier/adjective. The scoping facts may be determined by the semantics of the NPs, and some remarks are made on this in the following section. I shall concentrate subsequently on the problem of supplying a structure for these examples which allows the relative to attach to something above the noun, which will at least allow the possibility of the ambiguity, and on ensuring that there is a structural distinction in the syntactic representations of (3-26a) and (3-26b) which also appears in their partitive versions in (3-26c) and (3-26d). Before suggesting an alternative analysis, the following section investigates the relationship between the noun and the relative clause in some of the structures in question.

3.2.5. The Definite Article in Double Specifier Constructions

It was mentioned above that the definite article may not be necessary in the semantic representations of sentences such as (3-26b) above:

(3-26b) The few borrowers who have small mortgages are happy

The translation which was provided for this was:

(3-28) borrowers(x) & few(x,y) & large-mortgages(y) & happy(y)

However, it could be argued that (3-28) is more accurately a translation of the sentence below:

(3-34) Few borrowers have small mortgages and are happy

This may mean something different from (3-26b) in that it is possible for there to be people who have small mortgages who are unhappy, while (3-26b) excludes this interpretation. It seems therefore that the definite article does need to be represented in the translation of (3-26b) and it could be argued that it serves to specify that there is a particular set picked out by the noun and relative clause in the same way as in (3-35) below:

(3-35) The borrowers who have small mortgages are happy

The article would thus operate in its standard manner, relating the set denoted by the common noun (and its modifiers) to the context. However, it is also arguable that context need not play a part in such sentences. In the discussion of Ladusaw's work on the semantics of partitives in chapter 4 (Ladusaw 1982), the following example is cited (p.241):

(3-36) None of the students who enroll in 100a may also enroll in 100b

As Ladusaw points out (p.241), the definite article cannot easily be interpreted in these cases as relating a noun to an existing referent. It seems that there is a sense in which the definiteness in (3-36) is 'enclosed' within the relationship between the noun and the relative clause. At this point I should also point ahead to the discussion of the work of Löbner (1986) in chapter 4, in which it is argued that the definite article always marks a noun as being functional; the relationship may be to the context, or it may be that the noun is inherently relational (such as *tail* and *sister*). Löbner suggests that where this relation is a

function (i.e. where there is a unique relationship) the definite article is necessary because it always denotes such a functional connection. The functional relation need not therefore be contextual and so the definite article need not always indicate that a noun is to be related to something in the existing context of discourse. These suggestions are relevant here in that it may be that the relationship between the nouns and the relative clauses in some of the examples in (3-26) is functional in a similar sense. In effect, the set picked out by the specifier and the set denoted by the relative clause are identical, and it is arguable that the rôle of the definite article is to enforce this relationship.

3.2.6. The Structure of Double Specifier Constructions

The analysis which was developed above for double specifiers needs to be extended in order to account for the partitive versions. There are a number of ways in which this can be achieved, and I shall mention some alternatives briefly before describing the account in the SIP grammar. Firstly, some details were not provided in the rules and lexical entries which were given in introducing the problem. One difficulty with the rules as shown above concerns that analysis of quantifying nouns such as *a number*. In order to account for the quantificational nature of such items, the obvious move is to use the feature [Spec] which distinguishes quantifying adjectives. This allows general FP rules to be stated which cover the feature passing between SpecPs and [+Spec] daughters. However, the adjective rule suggested previously in (3-19a) is as shown below:

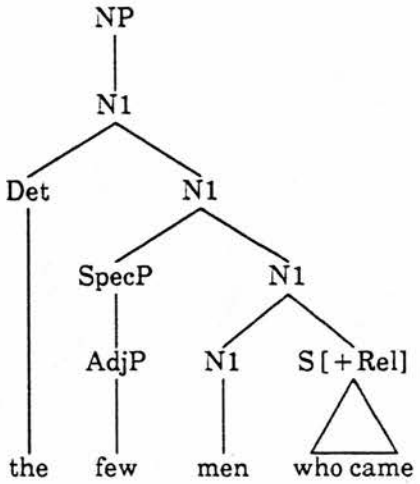
(3-19a)

[N1, −Cm, −Def, Spec $1] →
[AdjP, Spec $1],
[N1, −Cm, −Def, −Spec]

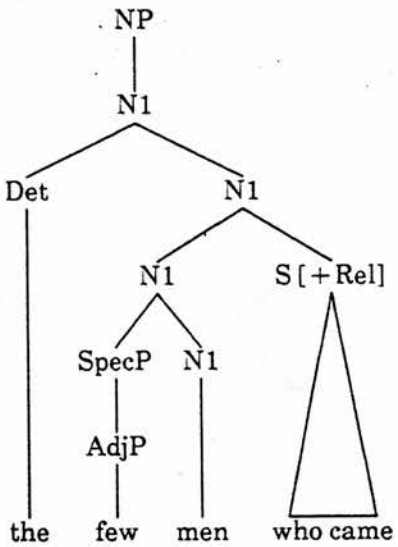
This would not allow any of the [+Spec] nouns to be modified by adjectives, ruling out *a large number, a significant amount*, and so on. Another problem is that in NPs like *the few men*, the specifier/adjective insists on agreement with the noun; **the few man* and **the many wine* should be excluded along with the partitive versions **the few of the man*, and so on. Rule (3-19a) will not account for these facts, which seem to be straightforwardly syntactic.

Given these data, and accepting the adjectival nature of *few* and *many*, there are at least three solutions which can be accommodated in the SIP grammar. The first would be to make the relationship between the specifier/adjectives and N1s always a SpecP-N1 configuration. However, this would also mean that the result of combining a SpecP and an N1 is not always an NP; sequences such as *some of the few men* should be allowed, which means that *the few men* needs to be an N1 in the grammar as it stands. This could be achieved fairly easily by passing a feature from AdjP[+Spec] to the SpecP to ensure that the mother fits two rules. One is the SpecP-N1 rule as it is given in chapter 2, the other would be a new rule of the form **N1 → SpecP N1**. Note that this solution would solve the problem of relative clause attachment as there would now be a suitable node for a RRel to modify which is not present in NPs such as *few men* or *few of the men*. To emphasise this point, the structures below represent analyses of *the few men who came* and *few men who came* using the rules suggested:

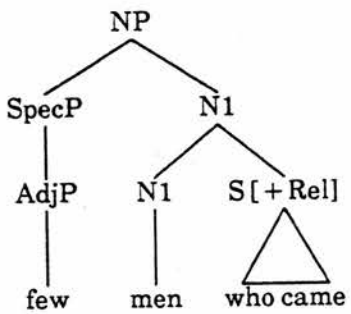
(3-37)



(3-38)



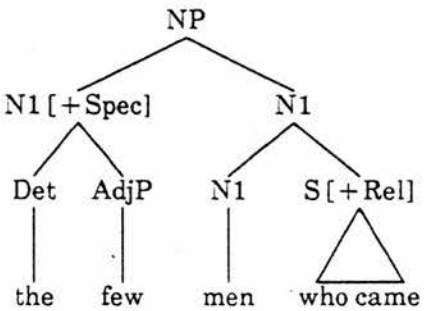
(3-39)



(3-37) and (3-38) represent the two possible structures for *the few men who came*; in (3-38) the relative clause is outside the scope of the specifier. As shown in (3-39), *few men who came* has only one possible analysis.

A second solution would be to analyse *the few* as a constituent, accepting that adjectives can form nominals with determiners, and then allow an N1 which has the feature [+Spec] to combine with another N1 to form an NP. The structure of *the few men who came* would thus be:

(3-40)



However, this would only produce the single analysis shown. In order to capture the supposed attachment ambiguity, it would be necessary to propose some kind of intermediate node between NP and its daughters. Note, though, that the definite article would only scope over the adjective, whatever the structure of the tree above the SpecP, and it is not clear that this is satisfactory given the discussion above on the semantic properties of these NPs.

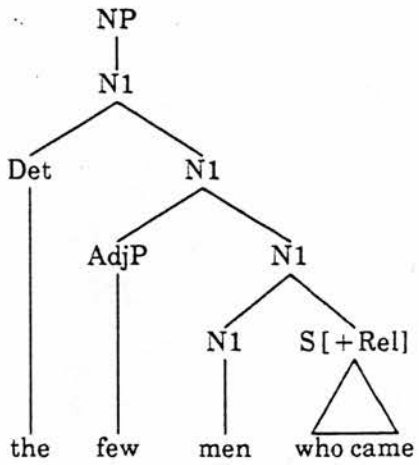
The solution which is employed in the SIP grammar is similar to the first proposal above, and has been employed mainly because it is the simplest. The main requirement is the addition of argument feature stipulations in the adjective rule (3-19a), which then becomes:

(3-41)

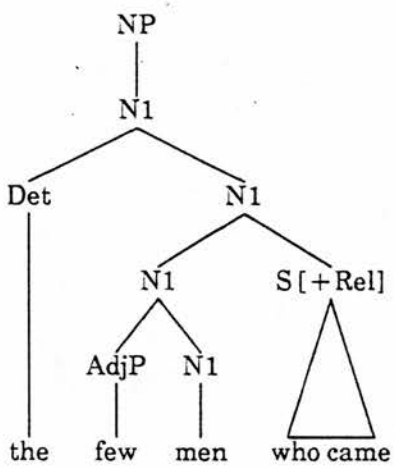
[N1, −Def, −Cm, Spec $1] →
[AdjP, Spec $1, ArgAgr $2, ArgDef $3, ArgCm $4],
[N1, Agr $2, Def $3, Cm $4, −Spec]

The analyses of the NPs in (3-37) and (3-38) are now:

(3-42)



(3-43)



There is no change to the analysis of NPs such as *few of the men*, which will still have the structure in (3-39) above. The structural configurations in (3-42) and (3-43) are identical to the first solution. In order for this proposal to work, some further adjustments are necessary in the grammar and lexicon. As it stands, the grammar will allow NPs such as *large of the men* because the category definition for adjectives will ensure that the features *ArgAgr, ArgDef* and *ArgCm* are instantiated on all adjectives. When the features are not explicitly stated in the lexicon, their values will be free variables, which means that the features on an adjective like *large* will unify in rule (3-41) with an N1 such as *of the men*. A simple way to block the unwanted parses is therefore to stipulate the necessary features on [−Spec] adjectives; this can be done theoretically by stating an FCR as below:

[AdjP, −Spec] ⊃ [−ArgCm]

In practice, the lexical entries can be altered accordingly so that, for example, the specification for *large* is as shown below:

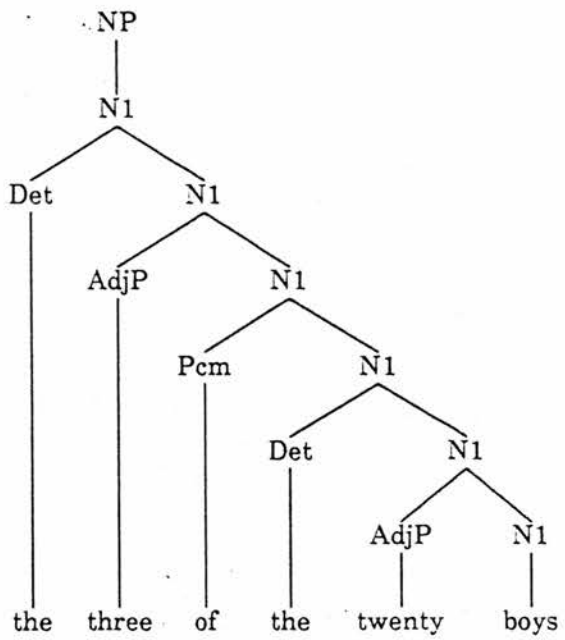
large: [Adj, −ArgCm, −Spec]

The problem which was mentioned above with the feature specification of the quantifying nouns remains, and it is assumed below that the use of [Spec] is inappropriate for these due to the difficulty which would result in trying to state a generally applicable adjective rule.

It is not clear that the solution which I have adopted to the problem of double specifiers is the best. Given the desirability of allowing the definite article to scope over more than the specifier/adjectives, and accepting the ambiguity of the definite examples in contrast to the 'indefinite' cases, then the structural configurations in (3-37)−(3-39), (3-42) and (3-43) are reasonable. The question is subsequently whether it is better to preserve a single statement of the operation of specifiers, as in the first solution, or whether a general statement which combines adjectival elements with N1s to form N1s is to be preferred. The first solution means in practice that two SpecP-N1 rules are necessary; one in which the mother is an NP, another in which the dominating category is N1. The second solution dispenses with the need for another SpecP-N1 rule at the expense of complicating both the feature specifications on adjectives and the relationship between AdjPs and N1s.

To conclude this section, the structure of Stockwell et al.'s example *the three of the twenty boys* will be as shown below:

(3-44)



Note that the rules will allow this kind of structure to iterate, and so NPs such as *one of the three of the many men who have long hair who came* will be parsed. These will be assigned multiple structures, the exact number depending on how the relative clause rule is stated.

3.3. Pseudopartitives

As discussed in chapter 1, Selkirk's account of pseudopartitives gives them the same basic structure as simple NPs; the following sections accept this suggestion and show how pseudopartitives can be incorporated into the grammar which is being developed. A fair amount of time is spent in providing a satisfactory account of the complex quantifying elements which typically appear in pseudopartitives; *a number, a lot* and so on.

Selkirk's examples of pseudopartitives, reproduced from chapter 1, are:

(3-45a) A number of objections
(3-45b) Three pounds of stew meat
(3-45c) A bushel of apples
(3-45d) Loads of time

One question which becomes relevant in the present formal approach is what the defining characteristics of these constructions are. The answer is simply that the quantifying element in pseudopartitives always insists on a case-marked N1, in contrast to the specifiers which have already been discussed. It is worthwhile looking in more detail at the first of the examples in (3-45) as, along with constructions containing *a lot*, *an amount* and probably also *a quantity*, it is the most typical instance of a pseudopartitive. In chapter 1 it was mentioned that, as far as possible, the definition of a partitive was to be semantic in the sense that a subpart is denoted. The same rule of thumb applies to pseudopartitives. There are many related examples containing collective nouns which denote more than just a subpart and which will be discussed later; for instance, *a herd of elephants*.

As mentioned in the introduction to this chapter, the level of description in what follows is rather detailed. This seems justified given the complexity of the data and the frequency of the items in question; to check the latter, I carried out brief examinations of two corpora. Note that the figures below may not be absolutely accurate, although errors are very unlikely. One corpus, developed in CSTR, is drawn from Cytopathology reports from the Department of Pathology at Edinburgh University, the other is the LOB Corpus (Johannson et al. 1978). In the part of the Cytopathology corpus which was checked (90,000 words), there are 27 occurrences of constructions containing *a number*, many with adjectival modifiers (*a large number*, and so on). The LOB corpus (1,000,000 words) contains 204 similar instances. These frequencies are much higher than those of many of the constructions which typically exercise linguists. It is also noticeable that forms such as *any number* and *some number* do not appear at all in either corpus; the only possible examples being two occurrences of *any particular number* in LOB. It is not clear that these are actually cases of *any number*. As for complexity, we shall see that it is

extremely difficult to express generalisations about the data.

3.3.1. Quantifying Nouns

I shall call items like *number* in *a number* and *amount* in *an amount* quantifying nouns, for fairly obvious reasons. One immediate problem with these, as noted in chapter 1, is that the status of the article is unclear. Selkirk classifies it as a normal determiner, which means that *a number* and *a student* are given the same analysis. There are problems with such an approach, notably when agreement facts are taken into account. In every use of *a* as an article, the NP is singular:

(3-46a) A student was here
(3-46b) * A student were here
(3-46c) A book is missing
(3-46d) * A book are missing

(I should note that *a* can also, of course, be *an*. The relevant form is used below as the phonological context demands.) The agreement characteristics of *a number*, however, suggest that it is nearly always plural:

(3-47a) A number of ideas were presented
(3-47b) * A number of ideas was presented
(3-47c) A number of people were there
(3-47d) * A number of people was there

A direct contrast with (3-46) is not straightforward because it is not easy to use *a number* without the N1 argument unless there is prior priming and ellipsis:

(3-48) Many people were present. A number were singing.

Using the singular in such cases is decidedly ungrammatical:

(3-49) * Many people were present. A number was singing.

This behaviour is inexplicable if *a(n)* is being used in its normal quantificational sense in which it passes singular agreement to the NP node. Similar problems appear with *a lot*, and to a lesser extent with *an amount* and *a quantity*. The former can take either mass or plural nouns, unlike *a number* which is restricted to plurals. However with the plurals the NP's agreement features are never singular:

(3-50a) A lot of problems were discovered
(3-50b) * A lot of problems was discovered

With *an amount* and *a quantity* the N1 argument should be mass in my idiolect (**an amount of people*), and so the NP agreement will always be singular if the same kind of treatment is given to these items as that suggested for specifiers like *some* above. The proposal is therefore to allow the NP's number feature to be passed from the noun via the quantifying element, which in these cases is a phrase made up of a noun and what I shall call the quantifier-determiner *a(n)* (QDet). The noun must be distinguished from others, and while it is tempting to employ the [Spec] feature which was used previously to sub-categorise adjectives, it was noted above that this can prove difficult to implement. I will therefore use [Qu] to make the necessary distinctions among nouns. The new lexical entry for *a(n)* will also be used in the analysis of the specifiers *a few* and *a little*. Before investigating the latter, the following rules and lexical entries have been suggested in the analysis of *a number, a lot, an amount*, and *a quantity*:

a(n):
QDet

number:
[N, +Qu, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], ArgDef $1, ArgCm of]

lot:
[N, +Qu, Agr [Num $1, +Ms], ArgAgr [Num $1, +Ms], ArgDef $2, ArgCm of]

amount:
[N, +Qu, Agr [Num sg, +Ms], ArgAgr [Num sg, +Ms], ArgDef $1, ArgCm of]

quantity:
[N, +Qu, Agr [Num sg, +Ms], ArgAgr [Num sg, +Ms], ArgDef $1, ArgCm of]

(3-51)

[SpecP, Agr $1, ArgAgr $2, ArgDef $3, ArgCm $4] →
QDet,
[N1, +Qu, Agr $1, ArgAgr $2, ArgDef $3, ArgCm $4]

Before discussing the lexical entries, note that rule (3-51) could easily be simplified using FP rules. It is, in fact, possible to have a single FP rule which would generalise across all cases of **SpecP → X** where X is a quantifying element by stipulating the head daughter in each rule and ensuring that the features come from the head. I shall adapt the FP rules here in order to take the feature [Qu] into account; the FP rule below will express the required information:

(3-52) {Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [+Qu, ¯F], @F

This states that, for the features *Agr, ArgAgr, ArgDef* and *ArgCm*, in a rule in which SpecP dominates a category which contains the specification [+Qu], then each feature is instantiated on the categories in question and the relevant values must unify. Rule (3-51) then simply becomes:

(3-51′)

SpecP →
QDet,
[N1, +Qu]

Looking now at the lexical entries for *a(n), number, lot, amount,* and *quantity* which were suggested above, it could be argued that there is a lot of redundancy in some of the entries in that the *Agr* features and the *ArgAgr* features are identical in each entry in which they appear. Note again that this is not generally true; different specifications are required for these features for *one,*

each, either and *neither* and the relationship between them is also not straightforward in the entries for *all* which were suggested in the previous chapter. However, it is relatively easy to capture the generalisation for this class of specifiers; one way is to use lexical rules such as those which allowed a single representation of the specifiers in chapter 2. In many representations, it is also possible to mark re-entrancy in the graph structure and hence indicate that the value of a particular attribute is repeated. This could be done, for example, in the entry for *number* above as follows:

number:
[N, +Qu, Agr [Num pl, +Ms $_{[1]}$], ArgAgr $_{[1]}$, ArgDef $1, ArgCm of]

Note that, as the *ArgDef* feature is variable in all the entries, both partitives and pseudopartitives are covered; thus *a number of students* and *a number of the students* are generated. The fact that the quantifying elements are nouns explains their appearance with adjectives in such as:

(3-53a) A large number of problems
(3-53b) A significant amount of liquid
(3-53c) A moderate quantity of sand

The only good examples with *a lot* seem to be *a whole lot* and *an awful lot.* It is not clear exactly what the status of *whole* is; it has at least something in common with adjectives, and in fact may be closer to examples like *numerous* than anything else. For one thing, it does seem to insist on singular nouns (**whole men*) which as we have seen sets it apart from most adjectives. I shall simply suggest here that *whole* is an adjective and note that in general the range of adjectives which can modify terms like *number* and *lot* is very restricted. It is further assumed that such restrictions are lexical-collocational. To complete the analysis of uses of the QDet, the following section investigates the complex specifiers *a few* and *a little.*

3.3.2. Quantifying Adjectives and QDet

The following lexical entries and rule will be used to analyse *a few* and *a little*:

few:
[Adj, Spec qdet, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms],
−ArgDef, −ArgCm]
[Adj, Spec qdet, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms],
+ArgDef, ArgCm of]

little:
[Adj, Spec qdet, Agr [Num sg, +Ms], ArgAgr [Num sg, +Ms],
−ArgDef, −ArgCm]
[Adj, Spec qdet, Agr [Num sg, +Ms], ArgAgr [Num sg, Ms $1],
+ArgDef, ArgCm of]

(3-54)

SpecP →
QDet,
[AdjP, Spec qdet]

Again, FP rules do the work of the HFC in passing most of the daughter AdjP's features to the mother. The main point is that the feature Spec now has three possible values drawn from the set: {+, −, qdet}. This is another shorthand way of representing the sub-categories and it would clearly be possible to introduce a subcat feature instead in a similar manner to the proposals for lexical rules in chapter 2. Note also that the entries for *few* and *little* are in addition to those which were assumed previously. This explains the different semantics of expressions like *few days* and *a few days* in which it is usually accepted that the former has a negative sense in comparison to the latter. This is true of *little* also. The following is the relevant lexical entry for *few*, which is to be contrasted with the one for *a few* above:

few:
[Adj, +Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], −ArgDef, −ArgCm]
[Adj, +Spec, Agr [Num pl, +Ms], ArgAgr [Num pl, +Ms], +ArgDef, ArgCm of]

As before, the fact that *few* and *little* appear in AdjP in the rule in (3-54)

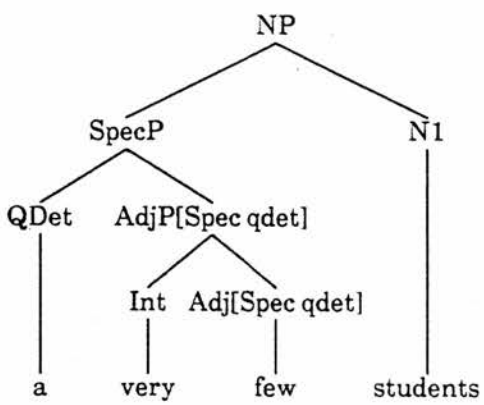
explains the occurrence of the intensifier *very* in such as:

(3-55a) There were a very few students
(3-55b) A very little wine was left

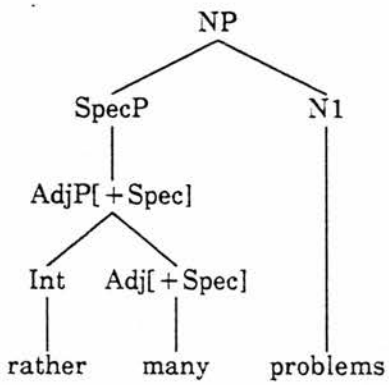
As with the adjectives modifying the quantifying nouns above, this is extremely restricted; in fact, the only good example is *very*. Once again I shall assume that the restriction is expressed in terms of the lexical constraints on the intensifier/adjective relationship. These restrictions are sensitive to the word classes of the items concerned, of course, which explains why the range of intensifiers is different depending on whether the adjective is specified as [Spec +] or [Spec qdet]. The separate lexical entries will not in this case be reduced to one by redundancy rules, and as noted above the semantics associated with the entries will be different.

To conclude this section, the following are analyses of the NPs *a very few students* and *rather many problems* with the significant features marked:

(3-56a)



(3-56b)



3.3.3. The Indefinite Article and QDet

There are two reasons for distinguishing QDet from the indefinite article (which is being treated here as a simple specifier). Firstly, it has very different distributions when compared with other determiners or specifiers. For one thing, no other item can appear with the adjectival specifiers *few* and *little* in the same way as *a(n)* (discounting expressions such as *every few days* and *each few seconds* on the grounds that they belong to a class of marked examples which involve temporal sequences). Looking at other possibilities, the idiosyncracy becomes clear:

(3-57a) * Some few people
(3-57b) * Any little wine
(3-57c) * Several few books
(3-57d) * Some little cheese

The specifier *a(n)* always takes a nominal complement, as do the other specifiers, and it is not clear that *few* and *little* should be analysed as nouns in order to preserve a general statement. The situation with the quantifying nouns is a little more complicated, and before looking at the possible alternatives to *a(n)* in specifiers such as *a number*, some remarks are necessary on the reasons for proposing that these examples are similar to *a few* and *a little*. The following few points must suffice. Firstly, there is the argument that

the grammar is simpler if only one extra classification for *a(n)* is introduced; as we have seen above, there are good reasons not to treat *a(n)* as a specifier in *a few*, and it will be argued below that it must be distinguished in *a number*, and so on, also. While it would be possible to separate the uses with the specifiers from those with the quantifying nouns, there is at least one piece of syntactic evidence that they should be combined. There are cases where the word *quite* seems to act as an intensifier with the items in question:

(3-58a) Quite a few students
(3-58b) Quite a lot of time
(3-58c) Quite a number of questions
(3-58d) Quite a little trouble

With the other specifiers, it appears that *quite* can only modify *some*:

(3-59a) * Quite few students
(3-59b) * Quite much trouble
(3-59c) * Quite several problems
(3-59d) Quite some time

There are reasons for singling out (3-59d) as a marked construction, however, which would mean that only the cases containing the QDet can be modified in this particular way by *quite*. Note firstly that only mass nouns are possible in constructions such as (3-59d) and that unlike, say *a lot*, the range of these nouns is very restricted:

(3-60a) Quite a lot of sand
(3-60b) * Quite some sand
(3-60c) Quite a lot of wine
(3-60d) * Quite some wine

Secondly, notice the following examples in which, it must be accepted, the judgements are tentative:

(3-61a) We arrived some time before them
(3-61b) * We arrived a lot of time before them
(3-61c) We arrived quite some time before them
(3-61d) ?? We arrived quite a lot of time before them
(3-61e) It will be quite some time until we return
(3-61f) ?? It will be quite a lot of time until we return

(3-62a) A lot of time is necessary to complete the thesis
(3-62b) ? Some time is necessary to complete the thesis
(3-62c) Quite a lot of time is necessary to complete the thesis
(3-62d) ?? Quite some time is necessary to complete the thesis

I suggest that there are two relevant senses in which *time* can be used; both are mass, but one refers to something like the logical time line while the other refers to the phenomenon of time itself. It seems to me that *quite some time* is much better when used to refer to the time line while *quite a lot of time* is best with the 'stuff' in question. In general, I feel there is enough evidence to argue that *some* can be distinguished from *a lot* and that only the latter can be intensified with *quite* in the relevant manner. The grammaticality test in appendix B contrasts strings such as those in (3-61), and I can report that the results clearly supported my judgements.

The specifier *a(n)* cannot be modified by *quite*; note that in the following examples the cases where *quite* can be interpreted as an adverb modifying the verb are irrelevant:

(3-63a) * Quite a book
(3-63b) * Quite a table

While it could be argued that in *quite* in *that's quite a book* is modifying *a book*, this should be compared with similar uses with *number*, such as *six is quite a number*. These seem entirely distinct from the examples in (3-58). I will not provide rules to handle the data in (3-58) and (3-59) here; it must suffice to note that a reasonably general statement is possible if the complex specifiers in question contain the same item.

Returning to the distinction between *a(n)* and specifiers, note that, as with the specifier/adjectives, most of the latter do not seem to be able to replace *a(n)* in the quantifying noun examples:

(3-64a) * Every number of students
(3-64b) * Each number of problems

The specifiers which require mass and/or plural nouns are also clearly excluded. On the other hand, the following are possible:

(3-65a) Any number of books
(3-65b) Some number of questions

These will be discussed below in section 3.3.4. which looks at the possibility that there are other QDets. Firstly, note that there are also cases containing demonstratives, for instance:

(3-66a) A number of problems
(3-66b) The number of problems
(3-66c) An amount of rice
(3-66d) This amount of rice
(3-66e) A lot of them
(3-66f) The lot of them

However, the NPs in (3-66) illustrate the fact that the quantifying nouns have two, quite distinct, senses. With *number*, for example, the semantics denotes either the cardinality of a set or, as previously, a vague predicate of a set. Notice that, in contrast to *a number*, agreement with *the number* is singular:

(3-67a) The number of problems is significant
(3-67b) * The number of problems are significant

Similar points are true of *an amount* and *the amount*, although as pointed out previously, agreement cannot be adduced. In general, then, the QDet seems to pattern differently from all the other specifiers, and the second reason for distinguishing it is that in some of these distributions it exhibits behaviour

which is not seen when it is a specifier. Notably, the agreement facts which were discussed above may be cited here, but also there are problems for semantics in interpreting the use of *a(n)* in *a number* and *an amount* compositionally on the assumption that the nouns have something like their standard meaning. Taking the usual translation of *a(n)* to be a statement of existence, *a boy* will denote any boy from the set of possible referents. However, with *a number*, only numbers of a certain size are possible; *a number of boys* cannot denote one or two boys. This is also true of *any number*, which seems more emphatic and which may therefore denote a larger set than *a number*. These observations lead to the question of whether or not the specifiers in (3-65) should also be classified as QDets. The following section investigates this possibility briefly and makes some general points.

3.3.4. Other QDets

It was suggested above that there appear to be other items which can occasionally replace *a(n)*. The examples given were:

(3-68a) Any number of books
(3-68b) Some number of questions

However, there are problems in classifying *any* and *some* with *a(n)*, one being that the grammar would generate sentences like *any large number of questions* and *some moderate amount of wine*. The first of these is not acceptable as an alternative to *a large number of questions*, even though instances without the adjective do seem very close semantically, and I think this illustrates an important point about all the data which have been presented in sections 3.3.1., 3.3.2., and 3.3.3.

It seems clear that quantifying terms such as *a number, a lot,* and *an amount* are semi-formulaic in the sense that they may be becoming discrete lexical

entries which are not semantically compositional. The problem, of course, is that this is only partially true; any treatment of *a number* as a lexical item has to account also for *a large number*, and so on. It could be noted that similar data representing phrasal verbs provided much of the grounding for the introduction of transformations into phrase structure grammar in the early days of generative grammar, and this underlines the problematic nature of the examples. It really is not clear how to capture the relationship between *any number* and *a number* while stating the distinctions which are necessary. At some point an essentially arbitrary classification must be made. To emphasise this point, note that *some number* has features in common with both the previous cases and also some distinctions. Thus *some large number* is possible, but it is not clear whether or not agreement with this NP is plural or singular:

(3-69a) Some number of problems was discussed
(3-69b) Some number of problems were discussed

As with many similar examples, of course, it can be argued that the tendency for verbs to agree with immediately preceding nouns, no matter what the syntactic relationship, must be taken into account. However, it does seem that, in contrast to cases containing *a number* and *any number*, the agreement facts are much less clear. Also, as mentioned in section 3.3.3., it is not possible to use either of the latter specifiers to refer to a very few items. This does not seem to be true of *some number*; it appears to me that either sentence in (3-69) could be used to refer to a small set of one or two problems.

In general, then, I shall assume that there are no particular advantages in classifying *any* and *some* with the QDet *a(n)*. In particular, the fact that the semantics of the three complex specifiers cannot simply be built compositionally suggests that they require separate treatment. As both *any number* and *some number* are of a much lower frequency than *a number*, as pointed out in section

2 above, I shall not provide rules or lexical entries here.

3.3.5. Other Pseudopartitives

It was mentioned above that NPs like *a herd of elephants* may be pseudopartitives. Selkirk states that *a bunch of daffodils* is to be treated in the same way as her measure phrase partitives and pseudopartitives. Her examples, which were given in chapter 1, are:

(3-70a) A number of objections
(3-70b) Three pounds of stew meat
(3-70c) A bushel of apples
(3-70d) Loads of time

It was also stated above that the same notion of pure sub-part denotation should be applied to both partitives and pseudopartitives. It is not clear therefore that the collective noun cases are in the same class of constructions. Notice that, with varying degrees of naturalness, it is usually possible to front the case-marked N1 in partitives:

(3-71a) Of the daffodils, a few were withered
(3-71b) Of the students, several were stupid

Similar dislocations with collective partitives are ungrammatical for me while the other pseudopartitive specifiers tend to pattern with the more standard specifiers:

(3-72a) * Of the elephants, a herd was approaching
(3-72b) * Of the daffodils, a bunch was withered
(3-72c) Of the students, a number were surprised
(3-72d) ? Of the politicians, a lot were unscrupulous

Supplying more context and content to the examples usually allows an interpretation for sentences such as (3-72c) and (3-72d), while no amount of doctoring helps the first two cases in (3-72). Thus while *of the sand, an amount*

was wet may seem marginal, I suggest that the sentence below is quite possible:

(3-73) Of the water in Britain, a large amount is undrinkable

Note that no matter what the quantifying element is, it does not seem to be possible to front the case-marked phrase in a pseudopartitive and so there are no grounds for distinguishing collective noun cases from other specifiers in these constructions:

(3-74a) * Of people, a number are poor
(3-74b) * Of daffodils, a bunch was presented

I should note here that Grover (1986) suggests that there may be a class of constructions which are exemplified by the sentences below:

(3-75a) As for the women, they played tennis
(3-75b) On the subject of NPs, I liked Jackendoff's account

It might just be possible to find examples such as those in (3-74) which can be interpreted in this way; however, I suggest that any that exist are not really being used in the partitive sense. In general, I shall assume that the elements which I have been proposing as central in pseudopartitives (*a number, a lot, an amount,* and *a quantity*) can be distinguished from collective nouns. No doubt there is a cline of acceptability here; at one end lie examples such as Quirk et al.'s *suit of armour* in which *suit* has little or no quantifying sense and a good deal of inherent semantic content, and at the other lie things like *a number* of which the reverse is true and *a quantity* which is somewhere between but much nearer *a number*. I shall simply suggest here that a binary distinction can be drawn on the evidence of sentences such as those in (3-72). I shall also assume that the test itself is distinguishing between specifier-argument structures and cases of relational nouns such as those which are discussed later in investigating the work of Löbner (1986) in chapter 4. It is clear that *of* is used in a multitude of constructions in English, and I am therefore suggesting that

one use is to mark the relationship between the aforementioned relational nouns and their 'objects' in cases such as *a box of tissues* and *a deposit of money*.

Another class of expressions is usually lumped in with pseudopartitives; those containing measure-phrase elements. Thus Selkirk's examples contain NPs like *a bushel of apples* and *three pounds of stew*. My proposed test for these produces ambivalent results:

(3-76a) ?? Of the apples, a bushel was delivered
(3-76b) ?? Of the stew, three pounds were eaten

Again, it may be that supplying more content makes the examples more acceptable:

(3-77) ? Of the beans in the corner shop, five pounds were sold to a monk

If this is so, then it can be accepted that these measure words have a strongly quantificational function and should therefore be classed with the pseudopartitive specifiers.

One final relevant class of items is that comprised of nouns with the suffix *-ful* such as *spoonful* and *handful*. These seem to form partitives and pseudopartitives quite readily and may also just pass the fronting test:

(3-78a) A spoonful of sugar
(3-78b) A handful of the students
(3-78c) ? Of the sugar in the red bowl, a spoonful was put in each cup
(3-78d) ? Of the lecturers from AI, a handful know about linguistics

I shall therefore class these with the measure specifiers; they do seem to supply the same function in a vaguer manner. I shall say little more about pseudopartitives; it is assumed below that this chapter has served to show that they can be treated syntactically and semantically in exactly the same way as simple and partitive NPs.

3.4. Substantive Specifiers

One last type of NP is analysed by the grammar. It was noted above that **every of the men* is ill-formed while *every one of the men* is grammatical. I propose to account for this data by suggesting that one last feature is necessary to distinguish *every*, and to a lesser extent *each, any, either*, and *neither*, form the other specifiers. The main distinction is between *every* and the rest, given the following data:

(3-79a) Any of the wine
(3-79b) Some of the wine
(3-79c) Several of the men
(3-79d) Either of the men
(3-79e) Much of the wine
(3-79f) * Every of the men

It is noticeable that *every* patterns similarly in other environments:

(3-80a) I didn't bring any
(3-80b) I interviewed some
(3-80c) I ate several
(3-80d) I'd like either
(3-80e) ? I ate much
(3-80f) * I saw every

It is also noticeable that both (3-79f) and (3-80f) are perfectly acceptable when *one* is present:

(3-81a) Every one of the men
(3-81b) I saw every one

I propose to use the feature [±Subs] ('substantive') to account for these data, the suggestion being that the specifiers are to be distinguished depending on whether or not they 'stand alone'. Thus while *every* will be marked [−Subs], *each, any, either* and *neither* will be unspecified, and the other specifiers will be [+Subs]. These classifications will account for the following data:

(3-82a) Each of the students
(3-82b) Each one of the students
(3-82c) Any of the men
(3-82d) Any one of the men
(3-82e) Either of the books
(3-82f) Either one of the books
(3-82g) * Some one of the men
(3-82h) * Many one of the students

The revised lexical entries for *each* and *every* are therefore:

each:
[Spec, Agr [Num sg, −Ms], ArgAgr [Num sg, −Ms], −ArgDef, −ArgCm]
[Spec, Agr [Num sg, −Ms], ArgAgr [Num pl, +Ms], +ArgDef,
ArgCm of, +Subs]

every:
[Spec, Agr [Num sg, −Ms], ArgAgr [Num sg, −Ms], −ArgDef,
−ArgCm, −Subs]

The PS rule which will combine these entries with *one* to produce the required SpecP is:

(3-83)

[SpecP, ArgCm of, Agr $1] →
[Spec, −Subs, ArgAgr $1],
[Adj, +Spec, Agr $1]

The argument agreement features on all the relevant specifiers insist on a singular adjective, which will only allow *any one*, and so on. It is arguable that *any two boys* and *every three days* should be allowed in this manner also, and it would be possible to provide an analysis, but I have decided here that they are to be distinguished and handled separately. The main reason is that such an analysis would probably require further feature specifications in order to distinguish numerals from the specifier/adjectives. Failure to do this would allow NPs such as **every few of the days* and **any many of the men* alongside *?every four of the men.*

Rule (3-83) is not particularly satisfactory; note that it is necessary to specify explicitly that the mother has the feature [ArgCm of] in order to rule out **every one day* and **either one man*. A better solution might be to find a method of 'overlaying' the features on the specifier and adjective/numeral in a more principled manner. However, the entries given and the rule as shown do at least account for some of the data without overgenerating. Note that the relevant lexical entry for *each* has no specification for [Subs], which will allow both *each of the men* and *each one of the men*, as desired.

3.5. The SIP Grammar

Taking chapters 2 and 3 together, the core NP grammar has now been described apart from the simple AdjP rule which is given shortly. Six rules were introduced in chapter 2, and schematic representations of these are shown below:

(3-84a) NP → SpecP N1
(3-84b) SpecP → Spec
(3-84c) N1 → P N1
(3-84d) N1 → Det N1
(3-84e) N1 → N
(3-84f) N1 → Adj N1

Some of these were modified in the present chapter, which provides full descriptions of the following additional rules:

(3-85a) SpecP → AdjP
(3-85b) SpecP → QDet N1
(3-85c) SpecP → QDet AdjP
(3-85d) SpecP → Spec Adj
(3-85e) NP → N1[+Def]
(3-85f) NP → N1[+Mass]

One further rule is required in order to form AdjPs. Schematically, this is simply **AdjP → Int Adj** where the intensifier is optional. The actual rule is

only slightly more complicated:

(3-86)

AdjP →
Int ?,
Adj

The use of a question mark following a category signals optionality, so the compiler will construct two FBF rules from this; one with the intensifier and one without. An FP rule will ensure the necessary feature instantiations on the AdjP and Adj.

All the NP rules have now been described, and it is useful to make some brief general points about the grammar here. Firstly, I argue that it captures many of the important central facts of NP syntax in a concise and reasonably principled manner. In all, 13 phrase structure rules are required, and these rules produce just 14 compiled forms. Also, a total of 17 features are used, many of which are necessary outside NP (*Num, V, N, Bar, Cat,* and so on). Another point is that most of the overgeneration inherent in, for example, Jackendoff's approach is eradicated; some further discussion of this point is included in the section below on the Alvey Natural Language Tools Grammar. However, it can be noted here that an analysis which classes a few items as having an adjectival feature in order to account for multiple specifiers is clearly more restrictive than Jackendoff's approach in which two specifier nodes are used, in which case a range of further apparatus is involved. The adjectival classification is also justified by independent facts; this is not true of Jackendoff's proposed semantic classes which are decided "intuitively" (Jackendoff 1977, p.103).

One theoretical point which deserves some further attention concerns the question of what 'head' means in the SIP grammar. One of the standard tests for head-hood is to check agreement data to see which part of the NP agrees

with a VP. This kind of argument was used by Selkirk to suggest that NPs such as *the herd of elephants* have two structures with two possible heads, as discussed in chapter 1. However, in the NP rules which have been proposed above, it is not such a simple matter to tell where the agreement features originate; some come from the specifiers and some from the nouns. In effect, I am proposing that it is not possible to generalise about head features in nominals, at least as far as agreement is concerned. It seems clear that this must be accepted in the face of data such as the examples below:

(3-87a) This sheep is stupid
(3-87b) These sheep are clever
(3-87c) The men are drunk
(3-87d) The woman is sober

In (3-87a) and (3-87b), it seems that the agreement features on the NP must come from the determiner, while in (3-87c) and (3-87d) the noun must be the source. A detailed discussion of the possibility that twin heads are necessary in NPs can be found in Cann (1989); the SIP grammar is designed to allow flexibility in this area, and can be interpreted as an implementation of certain proposals in Cann's paper.

To conclude this section, note that a full listing of the grammar is provided in appendix A along with some further information on the SIP system. The listing includes declarations, PS rules, FP rules, example compiled rules, lexicon, example compiled lexical entries, and test data. There is also a short section showing the parsing environment in operation.

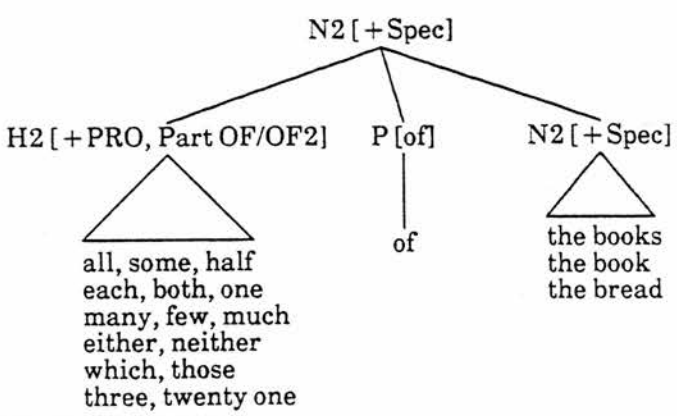
3.6. The Alvey Natural Language Tools Grammar

The Alvey Natural Language Tools Grammar (Grover et al. 1988, Grover et al. 1989) is the closest relative of the SIP grammar that I am aware of in form and spirit. For one thing, the Grammar Development Environment (Boguraev et al.

1988) in which the Alvey grammar was written is a direct relative of the SIP development environment. Furthermore, an important area of agreement between the Alvey grammar and the proposals detailed above is that the account of multiple specifiers in the former is partly based on Klein's paper. Grover et al. also supply an account of partitives which is partly compatible with Jackendoff's proposals and which, I argue, emphasises some of the problems inherent in an approach which assumes two NP nodes. The Alvey grammar is therefore directly contrasted here with the SIP grammar, and I shall refer occasionally to Grover (1986) which describes the specifier analysis in more detail than either of the technical reports above.[2]

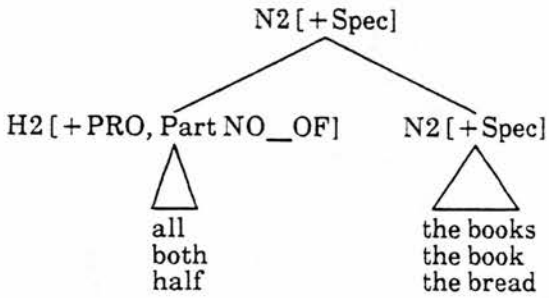
As Grover (1986) notes, and as mentioned earlier, many analyses of NP specifiers allow three main determiner/specifier positions in order to account for NPs such as *all the many men*. Stockwell et al.'s analysis is one example. Both the SIP grammar and the Alvey grammar analyse these NPs as partitives which are missing *of*, although the mechanisms which allow the optionality differ. In the SIP grammar *all* is marked, along with *both* and *half*, with a variable for the feature *ArgCm*. This allows the specifier to take either case-marked or un-case-marked N1s. However, in the Alvey grammar two rules are used to handle the data. The trees which are generated are shown below:

(3-88)



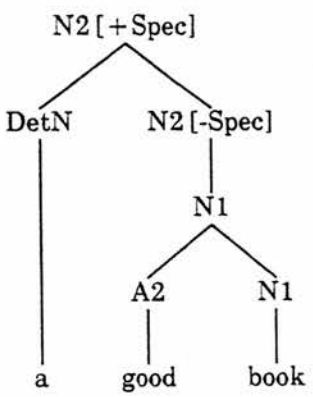
[2] The second release of the Alvey grammar (1989) has a revised account of partitives, and it is this account which is compared with the analysis in chapters 2 and 3.

(3-89)



The first structure actually covers two rules; one in which the specifier insists on agreement with the N2 (to analyse, for instance, *all, some*, and *any*), and one in which agreement is not required (which captures *either, neither*, and *each*). The specifiers are classified accordingly using the [Part] feature which takes two values: {OF, OF2}. Where the specifier is classified as [Part OF2], the NP is stipulated to be be plural in order to block **either of the book*. The rule which analyses the lower N2 node in the above structures generates trees such as (3-90) below:

(3-90)



As Grover et al. note, this rule will overgenerate in that *all many books*, and so on, will be allowed. Although their grammar does not account for pseudopartitives, it seems clear that a problem could arise also in ruling out NPs such as *a number of many books*. As for the partitive constraint, this is stipulated in the Alvey grammar by the use of the feature [±SPEC], rather than definiteness, and so partitives such as **all of some men* and **many of all*

men are allowed as the lower NP is marked [+SPEC], while **all of many men* and **many of men* are ruled out. Further restrictions would be therefore be necessary.

Another problem with the structure in (3-88) is that the partitive phrase does not form a constituent. Something has therefore to be done to explain cases where sequences such as *of the books* behave as if they form a single constituent; relevant arguments and data can be found in chapter 1, one of the more salient facts being the fronted partitive phrases in such as *of the students, many were from Russia.* These are difficult to handle if *of the students* is not a single structure. As Grover (1986) notes, and as argued extensively above, treating the partitive phrase as a PP has various undesirable consequences. However, I suggest that the SIP grammar presents a compromise between not analysing the partitive phrase as a constituent on the one hand and analysing it as a PP on the other.

In other respects Grover et al.'s account is compatible with the proposals in chapter 2. Notably, as pointed out above, the syntax of the quantifying adjectives such as *many* is basically the same in that the underlying assumption is that these are actually adjectives.[3] This assumption is formalised in the Alvey grammar by having two relevant lexical entries for *many*; one for partitives (in which it is pronominal) and one for the adjectival position. The proposals in chapter 2 allow a single specification given the appropriate use of a lexical rule, and this would not be possible for Grover et al., or at least, it could only be achieved with great difficulty if monotonicity is to be preserved.

The Alvey grammar thus contains a number of problems which require further

[3] To be more accurate, the feature [±PRD] is used to distinguish *many* and the others from the straightforward specifiers such as *some*. All of these items are analysed as adjectives in the Alvey grammar. However, this difference can be regarded here as a matter of nomenclature.

feature specifications to rule out unwanted parses.[4] There are also cases where it can be argued that significant generalisations are being missed, such as in the multiplication of lexical entries and the three separate partitive rules. Most of these difficulties can be overcome if the lower structure is assumed to be non-maximal and the specifiers are allowed to select complements, as we have seen here and in chapter 2. Generally, the Alvey approach serves as a useful explicit formalisation of parts of Jackendoff's account, and as such it highlights some of the inherent difficulties. Notably, the use of two specifier nodes causes more problems than it solves.

3.7. Summary

The arguments here and in chapter 2, taken together, suggest that a more unified account of simple, partitive, and pseudopartitive NPs is possible and often desirable. The three types of NP are distinguished by the syntactic features which the quantifying elements require on the N1 arguments, and some significant generalisations about their behaviour are captured due to the fact that a single syntactic rule is used to form all three. It will be argued below that the semantics is similarly uniform and that the single syntactic rule reflects the semantics.

[4] As Grover (personal communication) suggests, Jackendoff's restriction on the number of semantic quantifiers in an NP would rule out both **all many books*. It is not clear that **all of some books* would be blocked, however.

Chapter 4

Definiteness

4.1. Introduction

The previous chapters introduced some problems concerning the syntax of NPs. The aim here is to supply the background for an account of the basic semantics and to introduce some of the more important points for discussion. The main topic is definiteness. Many accounts of partitives and the partitive constraint assume that definiteness in the lower NP is the requirement which restricts the appearance of NPs like *some of few people*. The constraints suggested by Selkirk and Jackendoff, as pointed out in chapter 1, effectively make this requirement. It was also suggested in chapter 1 that certain kinds of extraposition are infelicitous due to definiteness. However, no attempt was made to explain the use of the term and I shall now outline the main issues.

There is a vast literature on the semantics of NPs. The sub-part of this literature which deals with definiteness covers a large range of concerns from the pragmatic to the model-theoretic, and it will only be possible to summarise some basic positions here. As with the previous chapters, the emphasis is on work which relates, directly or indirectly, to partitives.

I shall assume the general approach to model-theoretic semantics which was proposed by Montague (see for instance Montague (1974)) and which is described in Dowty, Wall and Peters (1981). GPSG85 adopts this approach, as outlined below, as do Barwise and Cooper's (1981) account of NP semantics and the amendments to this which are proposed by Ladusaw (1982). These accounts will be contrasted with what can reasonably be called the 'familiarity' theory of

definiteness which is introduced by discussing Clark and Marshall (1981). The latter discussion is used chiefly to introduce the area of research which is represented by Discourse Representation Theory (DRT) as proposed in Kamp (1981). Characterising familiarity was not the original aim of DRT, which is closely related to Heim's work on File Change Semantics (Heim 1982), but the theory does provide a framework in which the phenomenon can be at least partially characterised. Some important points which are made in Löbner (1986) are also discussed.

In general, then, the aim of this chapter is to outline some central issues in the study of NP semantics, particularly those which affect partitives. Chapter 5 introduces further background work on plurals and suggests a semantics for the syntactic rules in the previous chapters along the lines of the GPSG approach as outlined below. In certain aspects the proposals are indications of where further work is necessary as the topics involved require far more research than is possible here. One such topic, as we shall see, is the precise nature of the relationship between definiteness, generalised quantifier theory, and Discourse Representation Theory.

4.2. GPSG Semantics

GPSG85 provides a theory of semantic types for each syntactic category, and this section outlines the main points. The general approach will be used in chapter 5 when semantic operations are associated with the syntactic rules in chapters 2 and 3. It is assumed here that the general background to model-theoretic semantics is provided by Dowty, Wall and Peters (1981); an introduction to the specific parts of the theory which are relevant here is provided below.

4.2.1. Type Theory

The application of type theory to natural language semantics typically follows Montague (1973, 1974), and an extended introduction to the theory can be found in Dowty, Wall and Peters (1981). I shall refer to the general approach, following Montague (1973) as PTQ ('Proper Treatment of Quantification'). A description of the specific use of type theory in GPSG appears in GPSG85. Many of the issues which are discussed in these sources need not concern us here. For instance, the question of whether or not it is necessary to specify that all NPs must be intensional only becomes important at the major clausal level; the specification of the internal semantics of NPs can avoid this particular problem.

As Gazdar et al. point out (p.184), one of the main tasks for semantics in a theory of language is to specify an interpretation for all well-formed expressions. In model-theoretic semantics, this task can be split into two (Gazdar et al. 1985, p.184):

> (a) specifying the possible denotations of each syntactically determined category of expression, and
>
> (b) specifying the manner in which the denotations of complex expressions are produced as a function of the denotations of their constituents.

Thus given a noun such as *student*, (a) insists that the semantics should provide an interpretation for this expression in the model. In order to specify the interpretation of an NP like *many men*, however, the semantics must state how the semantics of the constituent expressions are combined, as proposed by (b). The first part of the task can be achieved by a function which assigns (sets of) interpretations to all the syntactic categories in the model. Given the noun *student*, the function will return the denotation of this word in the model. The second part is achieved by assuming the operation of functional application, so

the interpretation of *many men* can be discovered by applying the function denoted by *many* to the set denoted by *men*.

In Montague's approach a logical language (IL) is set up to mediate between expressions and set theory. This move is useful in that, among other things, it provides a shorthand method of representing the semantics of the expressions, thus avoiding the problem of the complex representation of sets. The basic semantic types of IL are represented by e and t (entities and truth values), and complex types are defined inductively by the following rules:

(4-1) If a is any type then so is $<s, a>$
If a and b are any types then so is $<a, b>$

The rule in IL which allows functional application is the following:

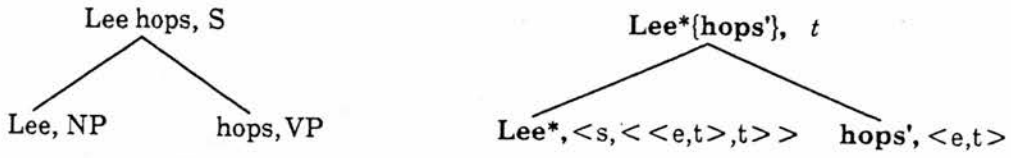
(4-2) If α is of type $<b, a>$ and β is of type b, then $\alpha(\beta)$ is of type α

Thus assuming that individual variables are of type e and that one-place predicate variables are of type $<e, t>$, then the type of the expression $P(x)$ is t (assuming the convention that x, y, z, and so on, are individual variables, while P, Q, etc, are one-place predicate variables).

These are the basics of Montague's approach to semantics; syntax specifies which categories combine to form a particular constituent, and for each rule one constituent denotes a semantic function which takes the denotation of the other constituent as an argument. (It is, of course, possible to have more than one argument.) Thus in combining NPs and VPs to form sentences, a decision is made about which category denotes a function over the other, and the mapping is into the denotation of S, which is usually a truth value. Taking an illustrative example from GPSG85, the syntactic and semantic representations of the sentence *Lee hops* are given below where (4-3a) is the analysis of the NP-

VP structure and (4-3b) is the associated semantic tree (p.189):

(4-3a) (4-3b)



It is assumed in GPSG85 that proper names are generalised quantifiers, and this is shown by the superscript on *Lee* in the above trees. The relationship between the syntax and the semantics is determined in rules such as those in (4-4) below (Gazdar et al. 1985, p.209):

(4-4a) <S → NP, VP; VP′ (NP′)>
(4-4b) <VP → V[2], NP; V′ (NP′)>
(4-4c) <NP → Det, N1; Det′ (N1′)>
(4-4d) <N1 → N[35], PP[*of*]; N′ (PP′)>

The specifications in square brackets represent the syntactic sub-categorisation requirements. Thus PP[*of*] is a prepositional phrase in which the preposition is *of*, and N[35] states that the noun in (4-4d) has the feature [Subcat 35] and hence restricts the words which can appear in the rule to a particular sub-class which is specified in the lexicon. In each rule the semantic part (following the semi-colon) indicates how the semantics of the syntactic objects are to be combined. The notational convention is that primes on syntactic categories indicate that the denotation is signified. The relationship between functors and arguments is shown by placing the argument in brackets as in, for example, Det′ (N1′) (4-4c). The determiner is thus a function over N1 denotations. As Gazdar et al. point out (p.209), the type theory ensures that the correct object is applied as a function; hence N1′ (Det′), for instance, is impossible due to the type assignments which are discussed in the following section. Note that specifications such as those in (4-4) are provided for the SIP rules in chapter 5.

4.2.2. GPSG Noun Phrase Semantics

Gazdar et al., following Thomason (1976), assume a simplified version of Montague's NP semantics by specifying that NPs denote sets of sets rather than sets of properties. Thus the variables x, y, z, and so on, range over entities rather than characteristic functions of functions from possible worlds to entities ($<<s, e>, t>$), as Montague proposes. The translation of the NP *some unicorn* and its type are given in GPSG85 as (p.188):

(4-5) a. $\hat{}\lambda P\exists x[\mathbf{unicorn}'(x) \wedge P(x)]$
b. $<s, <<e, t>, t>> = TYP(\text{NP})$

The formulae above assume the standard convention that primed symbols (**unicorn**') stand for non-logical constants of IL. Note also that Gazdar et al. use the symbol *TYP* for the function which maps syntactic categories into IL types. As mentioned above, the assumption that NPs are intensional (functions from possible worlds to sets of sets) is not necessary in the present account, and so it can safely be assumed for the moment that NPs denote sets of sets and hence are of type $<<e, t>, t>$. Nouns and N1s have the same type in GPSG85; $<e, t>$, and quantifiers denote functions from N1 denotations to NP denotations; $<<e, t>, <<e, t>, t>>$.

4.2.3. Summary

The main point to note from the above brief discussion is the explicit relationship between syntactic rules and semantic translations. This relationship will be assumed in chapter 5 when the syntactic rules in the SIP grammar are given a semantics. As we shall see below and in the first part of chapter 5, the fairly simple situation outlined above requires a good deal of amendment in the face of some rather complicated data. With the introduction

to GPSG semantics as background, the remainder of this chapter looks at various approaches to definiteness, beginning with the account which appears in Barwise and Cooper (1981).

4.3. Barwise and Cooper

One problem which partitive NPs pose for formalisations in a standard Montague Grammar framework (which is assumed in Barwise and Cooper (1981)) concerns the stipulation that structures with the same syntactic category should denote objects of the same semantic type. In partitives, of course, the specifiers do not appear in simple structures with common nouns and hence appear to require two semantic classifications. This is one of the problems addressed by Barwise and Cooper.

Another reason for looking more closely at Barwise and Cooper's work is that their account of definiteness represents an attempt to characterise the notion with no recourse to any formal apparatus other than a formal language which is directly interpreted in set theory. (Or more accurately, perhaps, in model theory.) I shall argue that this account is ultimately unsuccessful, and hence, assuming that Barwise and Cooper's formulation is the best that can be done, that definiteness should be handled in a formal framework that makes use of a notion of context other than the universe of discourse. This argument is clearly not necessarily valid; there may yet be a 'context-free' account of definite reference.

In some later sections of this chapter, notably those dealing with the work of Löbner (1986), reference is often made to Russellian approaches to formal semantics. Rather than explicitly review Russell in order to illustrate the few relevant points, I am adducing Barwise and Cooper as exemplars of the general approach and I will relate Löbner's criticisms specifically to this work. Löbner

himself often cites Barwise and Cooper in his arguments.

The essential point about Russell's approach to NP semantics which is relevant here is the assumption that definiteness is characterised by uniqueness. As an example, a simple sentence such as *the man walks* is typically translated into the logical form below:

(4-6) $\exists x(\text{man}'(x) \wedge \text{walks}'(x) \wedge \forall y(\text{man}'(y) \rightarrow y = x))$

This can only be true of one individual in the model. In Barwise and Cooper's account, the actual representation is different, but the underlying assumption is the same; definiteness is uniqueness in the model.

4.3.1. Generalised Quantifiers

Barwise and Cooper (1981) introduce a formal language L(GQ) as a revision of some aspects of standard first-order logic because, they argue, the latter is inadequate for expressing natural language quantification in at least two significant ways. Firstly, there are many sentences which cannot be formalised using the first-order quantifiers $\forall$ and $\exists$. Examples given by Barwise and Cooper are:

(4-7a) Most babies sneeze
(4-7b) More than half the people voted for Carter

These, and other sentences containing expressions such as *many, few, a few* and *several*, can be shown to be inexpressible in a logic which does not allow quantification over arbitrary sets in the domain (Barwise and Cooper 1981, pp.160-1, pp.213-4). The second problem pointed out by Barwise and Cooper is that first-order logic is inadequate in that the syntactic forms of many of its expressions vary greatly from the syntactic forms of their supposed natural language counterparts. Their examples are:

(4-8a) Harry sneezed
(4-8b) Some person sneezed
(4-8c) Every man sneezed
(4-8d) Most babies sneeze

Given that these sentences have the same syntactic structure NP-VP, there is clearly some difference between their form and the form of their expression in first-order logic. It has already been argued that (4-8d) cannot be symbolised, whereas the others would appear as follows (ignoring tense):

(4-9a) sneeze(h)
(4-9b) $\exists x[\text{person}(x) \wedge \text{sneeze}(x)]$
(4-9c) $\forall x[\text{man}(x) \rightarrow \text{sneeze}(x)]$

Barwise and Cooper argue that (4-9b), for example, is actually a representation of the sentence:

(4-10) Something was a person and sneezed.

(4-8b) and (4-10) are "logically equivalent, but linguistically quite different" (p.165).

There is no single item in the semantic representations of (4-8b) or (4-8c) which corresponds to the NPs in the original sentences. The representations also, of course, contain connectives not seen in the originals.

In purely formal terms, the first objection is stronger than the second, although the incompatibility of the symbolic forms is clearly unsatisfactory. One way to handle the problem of the inexpressible quantifiers would be to allow the domain of the logic to contain a sufficiently rich ontology by including numbers and functions over subsets. Barwise and Cooper hold that introducing all the abstract apparatus of set theory into every logical domain is unsatisfactory. Their solution to these problems exploits work done on generalised quantifiers (mainly in mathematics).

4.3.2. Noun Phrases as Quantifiers

Barwise and Cooper's proposal involves a use of the term 'quantifier' which differs from the use in the above chapters on syntax. As discussed in chapter 1, quantifiers are usually taken to be a sub-class of specifiers in traditional linguistics. However, following Montague, Barwise and Cooper suggest that NPs should be taken to denote quantifiers as they are the main operators in sentences, being functions over VPs. The traditional 'quantifiers' (*each, every, some, few,* and so on) are classed as determiners which, as we shall see, denote functions from nouns to sets of properties. Note that 'determiner' is being used by Barwise and Cooper where 'specifier' was often employed in the previous chapters. It was suggested in chapter 2 that it is necessary in the syntax to supply entirely different classifications for the specifiers and the demonstratives (which include the definite determiner). It is not possible to maintain this distinction when discussing Barwise and Cooper, although I have tried to use 'specifier' and 'the definite determiner' when referring to specific items. In general, 'specifier' is used to cover the specifiers and demonstratives in chapter 2, rather than Barwise and Cooper's 'determiner', because the former term was used for the larger set previously and so this usage seemed likely to cause the least confusion. However, on occasion (for example when quoting from the original) it is necessary to use 'determiner' to cover all the items in question.

4.3.2.1. The Basic Premises

Quantifiers, then, are to be identified with noun phrases; generally being combinations of specifiers and set expressions. A quantifier will combine with the set denoted by a VP to produce the values 'true' or 'false'. For example, in most models, the quantifier *every woman* will combine with the set given by *thinks* (the set of thinkers) to give the truth value 'true', as in standard

Montague grammar approaches. In older treatments, such as Russell's (see for example Russell (1905)), the truth of the sentence *every woman thinks* depended on all members of the set denoted by *every woman* being a member of the set of thinkers. Thus the formula $\forall x B(x)$ is true iff $B(x)$ is always true when x denotes any member of the domain. Barwise and Cooper's approach states that the truth of the sentence depends on the set denoted by *thinks* being a member of the set of sets denoted by the quantifier. Looking at it another way, the denotation of a quantifier is the 'family' of sets (as Barwise and Cooper put it) for which it returns the value 'true'.

This allows a formal representation in which there are semantic 'constituents' corresponding to NPs. Informal representations of the first three sentences in (4-8) are given as (p.165):

(4-11a) (Some person) (sneeze)
(4-11b) (Every man) (sneeze)
(4-11c) (Most babies) (sneeze)

Again, these are true if the sets of sets represented by the first constituent contains the set of sneezers. Thus quantifiers can be thought of as the semantic elements which assert that a set has a particular property. As Barwise and Cooper suggest, $\exists x \varphi(x)$ says that the set of things satisfying $\varphi(x)$ is a non-empty set. Similarly, $\forall x \varphi(x)$ asserts that the set contains all the individuals in the domain. More formally, the following are suggested representations for some of the quantifiers (in which $\|Q\|$ is the denotation of Q and E is the set of entities in the model) (p.164):

(4-12a) $\|\exists\| = \{X \subseteq E \mid X \neq \varnothing\}$
(4-12b) $\|\forall\| = \{E\}$
(4-12c) $\|\text{Finite}\| = \{X \subseteq E \mid X \text{ is finite}\}$
(4-12d) $\|\text{Most N}\| = \{X \subseteq E \mid X \text{ contains most Ns}\}$

Assuming that *some* is given the semantic representation in (4-12a), the NP in

(4-11a) will thus denote the set of sets in the model which each contain at least one person.

Barwise and Cooper assume two types of specifier; logical and non-logical. Logical specifiers such as *every* and *some* are part of the logic of L(GQ), the non-logical ones like *most* are not, having the same variable symbolic status as the set of entities and the relation symbols (which correspond to some VPs). Furthermore, there is no universal division here, and it is for this reason that L(GQ) is a "whole family of languages" (p.167), as different classifications of the specifiers will produce different logical languages. The basis for the distinction lies in the fact that the non-logical specifiers are dependent on context for their interpretation. By 'context', Barwise and Cooper mean in effect a particular logical model. Thus the logical specifiers have the same denotation for every model, whereas, for example, the interpretation of a quantifier like *many men* will depend on the contingent interpretations of *men* and of *many*. Barwise and Cooper assume that there is a fixed "rich context" (p.163) which determines the meanings of the basic expressions of the logic and refer to this notion as the "fixed context assumption" (p.163).

Barwise and Cooper make use of this view of quantifiers in two main ways. One is to suggest a number of linguistic universals which result from the formalisation, the other involves drawing formal distinctions between types of specifier. I shall omit a discussion of the universals here and concentrate on the suggested classes of specifiers as it is this classification that provides a basis for distinguishing definite determiners.

4.3.2.2. Sieves

One important classification of specifiers depends on the notion of a 'sieve'. Given the formal properties above, a quantifier can be described as sifting the

sets denoted by VPs into those that combine with it to produce true sentences and those that produce false sentences. It is possible for this operation to be degenerate; the quantifier may let *every* set through and it may let *no* set through. The examples given by Barwise and Cooper are *many men* and *every man*. The first will denote the empty set in models where there aren't many men, whereas the second will denote the set of all sets in models where there aren't any men. A quantifier is a sieve ('proper' quantifier) if neither of these states of affairs pertains. Barwise and Cooper then argue that some specifiers, for instance *both* and the demonstratives, always produce sieves.

It is useful at this point to note that the classification of specifiers depends on natural language judgements. This point is emphasised strongly by Barwise and Cooper (pp.201-2). Thus the distinction above involves the validity of the following arguments: NPs are generally understood as sieves; hence (using Barwise and Cooper's example) (4-13a) below is normally taken to entail (4-13b):

(4-13a) No boy at the party kissed Mary
(4-13b) There were boys at the party

However, it is possible to contradict this assumption as shown below:

(4-13c) No boy at the party kissed Mary, but only because there weren't any boys at the party

A quantifier is a sieve if such a contradiction is impossible. Thus the argument is that the following sentences are anomalous in some way:

(4-14a) * The men at the party kissed Mary, but only because there were no men present
(4-14b) * Both dogs in the garden bit the postman as there weren't any dogs in the garden

The proposed classifications therefore depend on the existential force of the quantifiers, a point which is perhaps clearer in the test suggested by Ladusaw

(1982; see (4-20) below). However, there does not seem to be an absolute distinction to be drawn here. Barwise and Cooper argue, for instance, that it is "hard" (rather than impossible) to contradict the existential force of specifiers like *every* (p.181). This argument is crucial in classifying the specifiers; the sentence below is adduced as evidence that *the* and *every* belong to different classes:

(4-15) ? Every man at the party kissed Mary, but only because there weren't any men at the party

There is more to say on this point, but it will be necessary first of all to look at what is, for the present purposes, another important division of specifiers into 'strong' and 'weak' classes. As stated above, the aim of these classifications is to provide a characterisation of definiteness; the distinction between proper sieves and the others does not capture the necessary classes as there are specifiers which appear to produce proper sieves which are clearly indefinite. An example would be *a(n)*, which is very difficult to interpret as a non-sieve:

(4-16) ?* A man at the party kissed Mary, but only because there weren't any men at the party

Barwise and Cooper therefore propose another classification of specifiers, as discussed in the following section.

4.3.2.3. Strong and Weak Specifiers

The distinction between strong and weak specifiers rests on the idea of a 'principal filter'. A quantifier is a principal filter iff there is a set which is a subset of each of the sets in the quantifier denotation. The common set is known as the 'generator', and a specifier is said to be 'strong' if it produces principal filters. One way to look at this is to say that there is a set which is the intersection of all the sets in a principal filter, this set being the generator.

This definition distinguishes, for instance, the family of sets corresponding to *some boys* from the family of sets corresponding to *the boys*; the intersection of *some boys* will normally be the empty set. There is further discussion of these points in section 4.3.2.5. below.

The terms 'strong' and 'weak' are borrowed from work by Milsark (see for example Milsark (1979)). He uses the terms to refer to the distinction between NPs which can and cannot appear in sentences like *there is/are NP(s)*:

(4-17a) There are some students
(4-17b) There are no tutors
(4-17c) * There is every man
(4-17d) * There are most people

Barwise and Cooper's test, however, is based on the set theory, and is of the form:

(4-18) DET N is a N/are Ns

The resulting sentences will be valid, contradictory, or contingent. For example:

(4-19a)	The dog is a dog	(valid)
(4-19b)	These tables are tables	(valid)
(4-19c)	Some cups are cups	(contingent)
(4-19d)	Many trees are trees	(contingent)
(4-19e)	No man is a man	(contradictory)

This classifies the specifiers in (4-19a), (4-19b), and (4-19e) as strong, and the others as weak. (4-19e) is negative strong, while (4-19a) and (4-19b) are positive strong.

4.3.2.4. Definite Determiners

Barwise and Cooper propose to distinguish definite determiners as a subset of the strong specifiers. They suggest that this is possible because the definite

determiners produce principal filters which are always sieves, in contrast to other strong specifiers which can, in some circumstances, denote the empty set or the power set. An example of the latter, they argue, is *every*, which as we have seen can appear in sentences such as (4-15) above:

(4-15) ? Every man at the party kissed Mary, but only because there weren't any men at the party

This is, in fact, the only evidence provided in order to classify the specifiers. As I noted above in the section on sieves, Barwise and Cooper say that such specifiers are difficult, but not impossible, to interpret as non-sieves. Ladusaw suggests another type of test, as below (cf. p.234):

(4-20a) Every unicorn can fly
(4-20b) The unicorn can fly

Ignoring the possible generic interpretation of (4-20b), the argument is that this statement indicates a commitment to the existence of unicorns while such as (4-20a) do not. Barwise and Cooper also point out that only the definite determiners can appear in NPs which fit contexts like *all of NP*, *some of NP*, *most of NP*, and so on. The explanation for this is that it is the "ability to uniquely determine the generator from the NP that allows the NP to play the role of a common noun and recombine with a determiner" (p.184). If these arguments are accepted, then a formal distinction can be drawn between strong, weak, and definite determiners. Before criticising this account, the following section discusses the use of the resulting classifications in characterising partitives.

4.3.2.5. The Partitive Constraint

Barwise and Cooper's formulation of the partitive constraint states, more or less, that if an NP is definite, then *Det of NP* is a possible noun phrase. Thus it will

not be possible to form NPs like *all of many men* because *many men* is indefinite. (It may be noted that frames like *all of NP* are proposed by Barwise and Cooper as a test for definiteness, as shown in section 4.3.2.4.. As this is an example of a partitive, there would appear to be a certain amount of circularity in this argument; an NP is definite if it appears in a partitive, and a partitive can only be formed using definite NPs.)

As mentioned in the introduction to this chapter, in formal approaches which follow Montague it is usually necessary to stipulate that all syntactic constituents of the same category should denote objects of identical types. Whether or not the partitive phrase is classified as a PP or a nominal, something must be done to provide an object which is semantically a set as an argument for the specifier. In order to handle this, Barwise and Cooper point out again that a definite NP has a generator set which is the intersection of all the sets in the quantifier. For example, with the NP *the men*:

$\cap\|\text{the men}\| = \|\text{men}\|$

As discussed above, this operation cannot be performed on NPs formed with the weak specifiers, which are not principal filters and hence do not have a generator set. For example, the denotation of *some men* is the set of sets which contain at least one man. It is clearly not necessary for these sets to have any common members; in other words, their intersection may be the empty set. This is not true of NPs formed with the strong specifiers; the set of sets which results all have a common subset, and Barwise and Cooper suggest that it is the fact that the definite determiners are always able to pick out a unique set that allows them to form partitives. They provide a formal account of this by adding a syntactic feature [of] to the specifiers which appear in partitives (in the matrix NP), and then by adding the syntactic rules below to the grammar (cf. pp.206-7):

$NP \rightarrow Determiner_{[of]}\ N_{[of]}$
$N_{[of]} \rightarrow of\ NP[+def]$

The logic is extended slightly to include the following syntactic and semantic rules:

*Syntax:*if Q is a quantifier, then $\wedge Q$ is a set term
Semantics:$\|\wedge Q\|$ is $\cap\|Q\|$

The translations associated with the two syntax rules above are given by:

$\|Det_{[of]}\ N_{[of]}\| = \|Det_{[of]}\|\ (\|N_{[of]}\|)$
$\|of\ NP\| = \cap\ \|NP\|$

The translations of the specifiers which are marked [of] are the same as their standard translations in simple NPs. In general, then, *of* acts on NPs to produce Ns in a kind of semantic type lowering operation. This approach to the partitive constraint is entirely compatible with the syntactic analyses in Jackendoff (1977) and Selkirk (1977) which were outlined in the previous chapter. Both of the latter authors pointed out that their versions of the constraint were purely observational; Barwise and Cooper's account provides an explanation in the semantics through an explicit translation of the syntactic forms into semantic representations. Before raising objections to certain aspects of this account, I shall look at the amendments to the treatment of partitives which were suggested by Ladusaw (1982) as this work also relates to the account of plurals which is suggested in chapter 5.

4.3.3. Ladusaw's Account of Partitives

Ladusaw largely accepts Barwise and Cooper's approach to partitives, but suggests the use of a more complex domain of entities in order to cover some data which they cannot handle (Ladusaw 1982). He proposes, in effect, to extend the basic set-theoretic ontology of the Barwise and Cooper model. In

addition to covering more data, he argues that his approach gives a more principled account of the partitive constraint. The theory involved is based largely on the work of Keenan (e.g. Keenan and Falz 1985).

4.3.3.1. The Basic Premises

Barwise and Cooper point out that their treatment cannot explain the deviance of sentences like (4-21a) below as compared to (4-21b):

(4-21a) * One of both men
(4-21b) One of the two men

The set theoretic descriptions of the specifiers *the two* and *both* are identical in L(GQ). Ladusaw argues that such sentences should be seen in the light of examples like the following (cf. p.236):

(4-22) Both John and Mary drink tea

His point is that the denotation of the conjoined NP in (4-22) is the intersection of the denotations of the two nouns, which is the set of properties which they both have. Thus when *both N* is defined, which is only for doubleton sets, it will denote the intersection of the principal filters generated by the nouns. Ladusaw then argues that there is another use of *and* in which the resulting compound noun denotes, not an intersection as before, but the properties which the two nouns have when considered as a unit. His examples of such properties are (p.236):

(4-23a) John and Mary are a happy couple
(4-23b) John and Mary love each other
(4-23c) John and Mary separated

Ladusaw points out that prefacing these compounds with *both* produces unacceptable sentences (p.236):

(4-24a) * Both John and Mary are a happy couple
(4-24b) * Both John and Mary love each other
(4-24c) * Both John and Mary separated

The explanation for the ungrammatical sentences in (4-24), of course, is that the predication involved is not on the intersection, while the denotation of *both* requires this to be the case. Ladusaw then examines the distribution of *the two* in the same contexts. His examples are (p.236):

(4-25a) The two students are a happy couple
(4-25b) The two students love each other
(4-25c) The two students separated

(4-26a) * Both students are a happy couple
(4-26b) * Both students love each other
(4-26c) * Both students separated

The specifiers *both* and *the two* are thus seen to be in complementary distribution in this context. The argument is therefore that it is possible to distinguish between specifiers in terms of something like a 'collective/distributive' contrast; some are for use at group level, some at entity level. Ladusaw now introduces the work of Keenan on Boolean algebras (e.g. Keenan and Falz 1985).

4.3.3.2. The Formal Account

Ladusaw's amendment depends on the introduction of a new set of individuals to the domain. In standard ontologies, the individuals are the members of the set of entities. Ladusaw proposes the use of a Boolean algebra in order to represent the denotations of NPs, and this allows him to introduce 'group level' individuals whose denotations are built up from the set of groups (G) (p.237ff). Thus common nouns (set terms) will take their denotations in G* and NPs will take their denotations in (G*)*. The relationship between E and G is defined by a function which maps every (non-empty, non-atomic) set in E* onto an atomic

individual in G. Thus, for example, *the man* will denote an entity-level individual, while *the men* will denote a group-level individual.

A similar account of NP semantics is proposed by Godehard Link using lattice theory (Link 1883, 1986a, 1986b). I shall discuss Link's work in Chapter 5, which deals with plurals. For the moment, the details of these Boolean algebras are not necessary, and I shall just describe briefly the use to which Ladusaw puts the formal apparatus in his description of partitives.

4.3.3.3. Partitives as Group-Level Individuals

The partitive constraint can now be expressed, not in terms of principal filters, but in terms of individuals. The requirements are that the lower NP in the partitive must always denote an individual, and that the set denoted by the whole phrase must be the set of entities which, as a group, generates that individual. Thus with respect to the distinction between *both students* and *the two students* in (4-25) and (4-26) above, the explanation is that the set denoted by *students* can be the 'real' set *or* the group-level individual. However, *both* only takes entity-level sets as arguments, while *the two* takes a group-level individual. Similarly, predicates such as *are a happy couple* only apply to group-level individuals, and so the anomalous sentences are the result of attempting to predicate at the wrong level. The result of Ladusaw's amendments are that the partitive constraint becomes a theorem of the semantics of the system (p.239).

4.3.4. Discussion

There are two main points which are worthy of discussion here. The first concerns the data which Barwise and Cooper use to classify the specifiers and the second issue is the question of how valid the definiteness constraint itself is.

Firstly, it seems sensible to suggest that, as the distinction between definite and indefinite determiners is so important for Barwise and Cooper, it would have been useful to have examined more data. Both Barwise and Cooper's and Ladusaw's analyses rely almost entirely on the behaviour of one word (*every*) to draw the distinction. There are other strong indefinite specifiers, including *all, each, most* and also (according to Barwise and Cooper) *more than half* and *at least half.* Barwise and Cooper's formalisation therefore predicts that the following sentences are difficult without being impossible:

(4-27a) Most children in the class drank milk, but only because there were no children in the class

(4-27b) Each child in the class was given a test, but only because there were no children in the class

Barwise and Cooper do suggest (p.180) that *most* should also be "hard" (not impossible) to interpret as a non-sieve. However, my reaction to both sentences in (4-27) is very difficult to distinguish from my reaction to the examples in (4-14) above; a relevant version of (4-14a) in the present context is:

(4-28) The children in the class drank milk, but only because there were no children in the class

I would hesitate to base a formal distinction on the presuppositional nuances which may or may not be present in these examples, and in order to test my intuitions, some suitable examples were included in the rough grammaticality test which is reported in appendix B. It was noted in chapter 1 that, while the test is neither comprehensive nor particularly well-designed, it does provide at least some data which do not depend on introspection. In present case it seems clear that there is little or no evidence that speakers detect a difference in the acceptability of the relevant sentences. Of the thirteen native speakers who complied with my request, seven failed to detect any distinction between the grammaticality of the three sentences below:

(4-29a) Every student looked good, but only because there were no students there
(4-29b) Each man kissed Mary, but only because there were no men there
(4-29c) The politicians agreed, but only because there were no politicians there

Of the six who found differences, three thought (4-29b) worse than (4-29c) while one suggested the opposite. This is clearly a problem for Barwise and Cooper in that a majority of speakers should detect a clear grammaticality split between these sentences, with (4-29b) being more grammatical than (4-29c), in order to classify the specifiers correctly. It seems, however, that the opposite is true. Comparing (4-29a) with (4-29c), the results are slightly better for Barwise and Cooper in that four speakers preferred the former while two preferred the latter. I suggest, however, that this is hardly strong enough evidence for a classification. Note also that five of the six who noticed differences found (4-29a) better than (4-29b), often significantly so. This is the clearest result, and suggests that, given the test proposed by Barwise and Cooper, the actual classes should group *every* and *the* together and contrast them with *each*. Again, this is obviously problematic, and it must be emphasised that the basis for the classifications of the specifiers rests on these judgements alone.

Applying Ladusaw's test to some of the other strong indefinite specifiers suggests that the sentences in (4-30) below hold a stronger commitment to the existence of unicorns than the sentences in (4-31):

(4-30a) The unicorns can fly
(4-30b) Both unicorns can fly

(4-31a) Each unicorn can fly
(4-31b) Most unicorns can fly

My intuition is once again that the difference is negligible, although I have not elicited many responses to such sentences (they are not included in the grammaticality test). However I have found few speakers who support the judgements who do not have a background in logic. The claim that it is

impossible to interpret definites as non-sieves seems too strong; to emphasise this, the following example appears in *The Independent on Sunday* magazine (29th April 1990, p.21):

(4-32) The only thing wrong with the British film business is that there isn't any

I suggest that such instances are fairly common and that, generally, a question must be raised about the strength of a theory which bases its classifications on judgements which only a few language users support, although the acceptability of the actual classifications is clear in the sense that *some of all men* and *several of few people* are clearly not well-formed NPs.

As an alternative to defining definiteness in set-theoretic terms, I suggest that a more pragmatic explanation in terms of the interaction of the NP with its context would be more fruitful. I should note, however, that such an explanation is partly rejected by Ladusaw in his 1982 paper. Referring explicitly to partitives, he argues that the semantics of these constructions cannot be "reduced completely to discourse-related pragmatic principles" (p.241) because there are certain types of NP which cannot be accounted for by relating them to context of use. Ladusaw's objection, of course, need not mean that "discourse-related pragmatic principles" cannot form the basis of an account of definiteness; merely that some problematic cases exist. The instances he cites are:

(4-33a) None of the students who enroll in 100a may also enroll in 100b
(4-33b) Most of what John earns is spent on books

In (4-33a), as Ladusaw points out, there is no existential presupposition, while the headless relative in (4-33b) "seems independent of the context of use" (p.241). However, these are strange examples to adduce in the framework which Ladusaw is assuming. As far as (4-33a) is concerned, the treatment of

definiteness (which is central to the account of partitives, of course) *depends* on the existential force of the quantifiers. The problem for Barwise and Cooper, and hence Ladusaw, in this case would be to explain how a partitive is formed at all when the determiner involved must be definite, which in turn means that it must be existential. In section 4.4., which deals with certain aspects of Löbner's work, the notion of functional concepts is introduced, and it seems likely that examples such as (4-33a) should be seen in the light of this research. A few further points are made about (4-33b) shortly.

The other main problem with the definiteness constraint is that, as Ladusaw points out, it seems to admit exceptions. He adduces the following examples (among others):

(4-34a) That book could belong to one of three people
(4-34b) This is one of a number of counterexamples
(4-34c) John was one of several students who arrived late

Ladusaw suggests that these are possible because "the user has a particular group of individuals in mind" (p.240). Notice that it may not only be partitives formed with *one* that behave in this way:

(4-35a) ? Many of a group of tourists who were passing at the time were carrying cameras
(4-35b) ? Much of a forest which was downwind was destroyed when the fire spread

It seems clear that the addition of post-modifiers, such as the relative clauses in the latter examples, makes the sentences more acceptable. I suggest that this is because the referents of the NPs are being introduced into the discourse, as usual using indefinite specifiers, and so the amount of information associated with the NP is an important factor. Judgements on how much information is appropriate are very subtle, and beyond the immediate scope of this investigation. For the moment it is enough to note that NPs such as *many of a*

group of British tourists who were passing at the time seem fairly acceptable and so represent counterexamples to the partitive constraint. Following Ladusaw's last suggestion about the "particular group of individuals", it might be argued that it is the use of a specific indefinite which licenses a partitive. However, examples such as those in (4-36) below also appear to be acceptable:

(4-36a) Not much of a British car is British these days
(4-36b) A little of a suitable herb should be added

Ladusaw's (4-33b), which contains a headless relative clause, is a similar case. The question now would appear to be whether the partitive constraint really exists at all, and the best answer may be that it does, but with certain classes of exceptions. How exactly these exceptions should be classified must be glossed over here apart from the observations which follow. Firstly, it is clear that Ladusaw's counterexamples in (4-34) are instances of a restricted set; it is not possible to form such NPs with any specifier:

(4-37a) * This could belong to one of most men
(4-37b) * This is one of some counterexamples
(4-37c) * John was one of all students who arrived late

One suggestion would be that it is the specifiers which were classified in chapter 3 as quantifying adjectives which appear in these constructions. It was suggested that this class includes *many, few, several* and the numerals, and it may be that the different semantic properties which these have when they are used adjectivally are the properties which allow them to occur in the environments in question. The appearance of *a number* in (4-34b) remains to be explained, however. Finally on these constructions, it is noticeable that the whole NP seems to have a restricted distribution:

(4-38a) * One of three people came to see me
(4-38b) *? One of a number of counterexamples was pointed out
(4-38c) *? One of several students who arrived late was punished

If the NPs is question are restricted to a particular configuration, this suggests that they are marked examples with distinctive properties. Secondly, on the counterexamples in (4-36), these should perhaps be seen along with the following sentences:

(4-39a) We drank a little of each wine
(4-39b) ? We ate a lot of every cheese

The NPs in (4-39) are not partitives, or, at least, are instances of a sub-class of partitives. Note that the meaning of (4-39b), for example, is not that there was a volume of cheese, denoted by *every cheese*, of which a large amount was consumed, but rather that there was a set of cheeses and a large amount of each member of the set was consumed. This is not usually how partitives operate; for example, *some of the students* simply picks a subset from the whole set denoted by *the students*. Assuming therefore that there is a separate construction, or a sub-class, in which the matrix specifier scopes over all the individuals denoted by the partitive phrase in turn, then this operation would account for the cases in (4-35) and (4-36) in which the partitive phrase just denotes a single individual. It may be possible to extend this explanation to cover headless relative cases such as (4-33b).

As mentioned in chapter 1, the majority of examples of partitives which are discussed in the literature contain plural nouns in the partitive phrase, and the latter examples introduce the question of whether or not constructions involving other types of noun are partitives. Generally, I can see no principled reason for rejecting a partitive analysis of *much of the water*, *many of the team*, and so on. Note that these would most probably be uncontroversial examples for Jespersen, given his discussion of NPs such as *half the population* (cf. Jespersen 1914, p.334). This topic is touched on again in the discussion of plurals in chapter 5 where the work of Link is investigated.

4.4. Löbner

Löbner (1986) suggests alternative grounds for rejecting Barwise and Cooper's account of definiteness. He argues that the assumption that NPs all have the same semantic type is false, thus explicitly contradicting one of the basic tenets of approaches which follow Montague (e.g. Montague (1974)). His basic approach to definiteness is in many ways traditional; one of his explicitly stated assumptions is that the definite article is an indication that the noun to which it is attached is to be used in a certain way. Much of what he says echoes work by such as Kamp and Heim, but he also rejects DRT. I shall outline here some of the main points which Löbner makes in his criticism of the Russellian analysis in which definite determiners are existential quantifiers which uniquely describe logical individuals. Apart from pointing out some more problems with standard accounts of definites, Löbner's work is useful, in throwing light on certain classes of definite NPs which, as we shall see, may help to explain some facts about certain kinds of extraposition.

4.4.1. Individual Terms and Quantifiers

One part of Löbner's argument aims to distinguish, formally, individual terms and quantifiers, and then to show that definite NPs are individual terms. He begins by suggesting three logical properties of individual terms (p.8):

T1. Individual terms cannot be negated
T2. (Consistency) If P is true for an individual term t then $\neg P$ cannot be true for t.
T3. (Relative Completeness) If P is false for an individual term t then $\neg P$ is true for t.

Assuming that NP can be substituted for t and VP for P in the latter conditions, these will supply a test for classifying NPs. The first point that Löbner makes is that indefinite NPs typically violate T2:

(4-40a) Many people have dishwashers and many people don't
(4-40b) One girl is tall and one girl is small
(4-40c) I have a car and you have a car

In the last case, Löbner argues that while this is not "overt", it is interpretable if *I have* is assumed to be incompatible with *you have* (p.9). (Some further assumptions must be made here about the syntactic categories which are to be substituted for *P* and *t* in T1-3; *I have* is not a VP.)

It is also argued that T3 does not usually hold for indefinite NPs; Löbner's example here is that the falsity of the sentence *three students are Italians* does not imply that three students are not Italians. Also, on the assumption that quantifiers are second-order predicates (which can be negated), it is to be expected that quantificational NPs will violate T1. Löbner suggests that "at least some" (p.9) quantificational NPs can be negated:

(4-41) Not all/many children are watching TV.

The weak quantifiers (as in the discussion of Barwise and Cooper above) violate T2 in that, for example, *some speech systems work* does not imply the falsity of *some speech systems do not work.* Finally, T3 does not hold for universal quantifiers. Löbner's example is that if *all the children are boys* is false, then it is not necessarily the case that all the children are girls.

Definite NPs, meanwhile, fulfil all three conditions:

(4-42a) * Not the children are playing (T1)
(4-42b) * The children are noisy and the children are not noisy (T2)

Löbner suggests that T3 is effectively a statement that the negation of the sentence is equivalent to negation of the predicate. For singular definites, this is clearly true, and the example given is that the sentence *Cesar is a good fellow* is false iff *Cesar is not a good fellow* is true. However, the situation with plural

definites is more interesting. As Löbner notes, in Russellian treatments, the plural definite article is a synonym for *all*. (This is true of Barwise and Cooper's account.) If this is the correct treatment, then definite plural NPs should violate T3 in the same way as the universally quantified NPs. In order to investigate this proposition, Löbner imagines a context in which some children are playing; some are dirty, some are not. In this case neither *the children are dirty* nor *the children are clean* is true; but they are not false in the sense which Löbner requires either. He suggests, in fact, that they are truth-valueless, and notes that the same kind of truth-value gap appears with singular definites also; *the boy is dirty* could be both true and false in the same way. Generally, this allows Löbner to argue that T3 is true of all definites; the appearance of truth value gaps only emphasises the point that the condition is completeness relative to a range of predicates. While *are dirty* and *are clean* are not in the predicate range of *the children* in the latter context, they are in the range of *all children*.

Before going on to some more objections which Löbner has to Russell's approach, it is worth noting a couple of points about the latter discussion. Löbner adduces no independent grounds for the classifications into quantifiers and (definite) determiners. If the assumptions T1, T2 and T3 were to be used generally to test all the noun specifiers, then not only the NPs formed with definite determiners would be classified as individual terms. The class of strong specifiers which Barwise and Cooper discuss also typically satisfy all three conditions:

(4-43a) * Not both men were here
(4-43b) * Not each man was here

(4-44a) * Both men ate fish and both men didn't eat fish
(4-44b) * Every/each man ate fish and every/each man didn't eat fish

(4-45a) * Both children were dirty and both children were clean
(4-45b) * Every/each child was dirty and every/each child was clean

With reference to the examples in (4-43), it must be accepted that *not every man*

snores provides a counterexample which satisfies Löbner's conditions along with *not all men snore*. However, the other cases are problematic for him in that they all appear to have the properties of individual terms. It is true that the examples in (4-45) do not exhibit the truth value gap which is characteristic of plural definites, but this does not affect the argument. On these grounds, therefore, there is nothing to distinguish definite NPs and the latter quantified NPs. If T1, T2 and T3 characterise individual terms, then *both men* and *each person* are just as much individual terms as *the dog*. Without independent means of classifying specifiers, it is not enough to say that some features are characteristic of quantified NPs and some of definite NPs.

It seems therefore that Löbner's assumption of classes of specifier needs to be refined. As shown, the strong specifiers are problematic, and further evidence is required to show that these do not form NPs which are individual terms. These questions must be left aside here as they are problematic for Löbner's proposals, and not for my own account; Löbner could perhaps draw on some aspects of Barwise and Cooper's suggested classifications in order to make the necessary refinements. The main point of the above introduction to his approach is to provide a background for the following discussion of classes of noun.

4.4.2. Definite Noun Phrases as Functional Concepts

In introducing Löbner's work, I mentioned that he wishes to classify nouns depending on their inherent semantics. His main argument here is that approaches to definiteness which assume that the canonical instances are anaphoric and/or deictic (as in DRT) are wrong, and that the best characterisation of definiteness follows from a generalisation of what he calls "semantic definites" (p.32).

The most important initial distinction is between nouns which denote relational

concepts and those which denote sortal concepts. Note that for concision I will often use 'noun' in what follows where 'noun denotation' would be more accurate. One illustration of the relational/sortal classification which Löbner provides is the contrast between *daughter* and *woman*. He points out that, in terms of their extensions, these words are identical; every woman is a daughter and every daughter is a woman. However they clearly have different meanings, and Löbner suggests that this difference is most successfully captured by assuming that *woman* is a one-place predicate while *daughter* is a relation with two arguments. Relations have further sub-types, the most notable being those which relate objects unambiguously (one-one) to others; in other words, functions.

Löbner's point here is therefore that certain nouns denote inherently unambiguous relationships, and as such only allow the indefinite article in certain unusual circumstances. For example, taking the definition of a two-place functional concept to be an assignment of objects to objects (p.28), the word *tail* will denote such a function. Assuming, as Löbner argues, that the definite determiner indicates that the noun is to be taken as a functional concept, then NPs like *the dog's tail* (or *the tail of the dog*) are to be expected, rather than *a dog's tail*, and so on. The only cases where the definite article is not found are those in which the existence of the object is in question, as in (p.30):

(4-46a) Does a makak have a tail?
(4-46b) This car has no clutch

Löbner argues that in such cases:

> If the additional argument of a two-place functional noun is implicitly or explicitly existentially bound (or left open), the result is a sortal concept. (p.30)

One more distinction is relevant here, partly because it forms the main grounds for Löbner's rejection of DRT as a suitable means for representing semantics.

He argues that definites can be sub-divided into semantic and pragmatic depending on whether or not they rely on context. Thus:

> A NP is a *semantic definite* iff it represents a functional concept, independently of the particular situation referred to. (p.32)

The most obvious examples of semantic definites are proper names, whose semantic values do not vary in Löbner's account, and NPs which contain the definite article, a sortal noun, and a proper name. Instances of the latter suggested by Löbner are; *the year 1984, the word 'the'*, and *the opera Rigoletto*. It is the semantic definites which, Löbner argues, present problems for DRT as "the referent of the definite is established independently of the immediate situation or context of utterance" (p.32). Such examples, like Ladusaw's problematic cases above, certainly do indicate that definiteness is not only a marker of contextual significance. However, there is no need to interpret these problems as meaning that there is no point in looking at cases where definite NPs do seem to refer to existing objects. The latter cases must be handled, and it is possible to investigate the correct analysis without making a decision about the 'true' nature of definiteness. As mentioned in the introduction to this chapter, I am assuming that DRT provides at the very least a useful framework for looking at the phenomenon. In order to provide some background to DRT, section 4.5. below assesses some of the problems inherent in the traditional 'familiarity' view of definiteness in which the use of the definite article is related to the distinction between 'given' and 'new' information. Before looking at these questions, however, a few points should be noted following the discussion of Löbner's work.

One important insight of Löbner's account is that some nouns are relational and that this fact explains some aspects of definiteness. It was mentioned above that this point is important here in that, apart from the semantic classification of the nouns which is entailed, there are implications for some of the arguments

which appear in, for example, chapter 1. Thus it was suggested there that extraposition from definite NPs is typically difficult, and that this explains the proposed grammaticality difference between sentences such as:

(4-47a) A teacher was chosen with the right approach to children
(4-47b) *? The teacher was chosen with the right approach to children

However, some of the other sentences which were discussed came from Selkirk's account of NPs and represent uses of a relational nouns (Selkirk's judgements):

(4-48a) ?* How many of the answers have been found to this classical mathematical problem?
(4-48b) ?* Two of those reviews have been reprinted of Helen's first symphony

It seems clear that *answers* and *reviews* are relational, and this introduces another dimension to the question of whether or not extraposition is permissible. In Löbner's terms, where the functionality of an NP (and hence its definiteness) is due to its relation with the context of utterance, there are grounds for distinguishing the NP from inherently functional examples such as *answer*. It appears that, in the latter cases, extraposition of the construction which expresses the argument in the relation may be easier than extraposition of part of a contextually functional instance. This would explain the difference which I am proposing between cases such as (4-47b) and (4-49) below:

(4-49) ? The answers have been found to this problem

With reference to the grammaticality test in appendix B, examples such as (4-49) seem to be accepted more readily than those in (4-48) above, although there is no evidence that speakers would reject any of the sentences as ungrammatical. Some results of the test were discussed in chapter 1 in which the following sentences were contrasted:

(4-50a) The reviews were published yesterday of Potter's new play
(4-50b) A number of the reviews were published yesterday of Potter's new play

Briefly, seven people (out of thirteen) found (4-50a) perfectly grammatical as against three for (4-50b). Only one person thought (4-50b) ungrammatical, and the same person found (4-50a) only just acceptable. Similar results were obtained for other contrasts of this type; I conclude that there is no reason to propose that a grammaticality split exists between the examples in (4-50) (as Selkirk suggests).

However, it must be accepted that speakers to find (4-50b) worse than (4-50a). The distinction between contextual and inherent functional concepts has no bearing on this difference and I can only suggest that the increased processing requirements of the partitive cases explains the difference. Note that one result of Löbner's work is that he has identified a class of definite NPs which introduce referents into discourses rather than operating as referring expressions. With the partitives in (4-48), then, the speaker is both introducing and quantifying over a new discourse entity in a similar manner to the examples containing indefinites which were discussed in (4-35) above:

(4-35a) ? Many of a group of tourists who were passing at the time were carrying cameras
(4-35b) ? Much of a forest which was downwind was destroyed when the fire spread

It is therefore possible to generalise over the examples in (4-48) and (4-35) by stating that more processing effort is required to handle such cases. It is possible to add a little more formal content to such a statement in a DRT framework, and in order to provide the background for this, the following section discusses definiteness in the context of familiarity.

4.5. Familiarity Theory

There is a very traditional and apparently feasible view of definiteness which can be paraphrased roughly as saying that a definite NP refers to an 'already mentioned' or contextually salient object. As usual with such vague rules of thumb, attempting to formalise this notion, or even just state it more precisely, proves to be problematic; this is no doubt another example of the persistent trade-off in linguistics between being precise and being correct. However, a number of significant attempts have been made in recent years to add some formal content to the notion, notably in the work which follows Kamp (e.g. Kamp 1981) and Heim (1982). This section briefly investigates the general issues.

Clark and Marshall (1981) also attempt to be more precise in defining the traditional view. They base their approach broadly on the work of Hawkins (1978), who suggests the following conditional statement:

if
(entity is in discourse model) *or*
(entity is visible) *or*
(entity can be inferred from immediate situation) *or*
(entity is shared because of specific knowledge) *or*
(entity is shared because of general knowledge) *or*
(entity is associated with another in the discourse model)
then
(build a definite description)

This is taken very much out of context, of course, but it does indicate the difficulty involved in expressing the requirements precisely; the last four conditions require a lot of work in this respect. Clark and Marshall approach the problem by assuming that some of the above clauses could be collapsed if a reasonable statement could be made about what constitutes shared knowledge. It should then be possible to build models of this knowledge and relate uses of

definites to them. However, Clark and Marshall also argue that there is a serious problem in stating the conditions for shared knowledge; briefly, if it is necessary for the speaker to know that the hearer knows that the entity in question represents shared knowledge, then it is also necessary for the hearer to know that the speaker knows that the hearer knows, and so on. The problem is therefore that an infinite number of such conditions would appear to be necessary.

It is not clear that satisfactory solutions to this problem exist. It may be noted that Relevance Theory (Sperber and Wilson 1986) attempts to provide a formal account of speaker and hearer inferences in an interesting manner which circumvents the problem of infinite regressions. I shall restrict the problem here to that of determining a connection between an NP and an existing referent and leave aside the issue of how speaker and hearer models are to be related.

As suggested above, one approach to the restricted problem is to use DRT to supply the formal basis for 'already mentioned' material, as I shall show below in investigating the work of Zeevat (1989a) in which many points which are relevant to the discussion of the above list of conditionals reappear. I should note that some aspects of the speaker/hearer problem, specifically those dealing with propositional attitudes, are discussed in a DRT framework in Kamp (1985).

4.5.1. Discourse Representation Theory

In some ways DRT occupies an area between the purely set-theoretic approach and the traditional account. The accent in Kamp's original (1981) paper is on preserving a model-theoretic formalisation of truth; however it is the truth of discourses rather than isolated sentences which is in question, and in the process of building a representation of a discourse it is possible to include formal

operations which can be interpreted as accounts of familiarity theory. It should be noted that the 1981 paper which I shall use to illustrate the theory does not discuss definiteness. Heim's work is actually more relevant here. However, the background to both authors' work is very similar, and as Kamp's is the earlier paper I have used it. It is relatively straightforward to provide a reasonable account of definiteness, given the background, as I shall show with reference to the paper by Zeevat mentioned above (Zeevat 1989a).

For both Kamp and Heim, one of the most important aims of their work is to provide a theory which accounts for the fact that indefinite NPs seem to require at least two completely different logical translations, depending on their context of use. Kamp's first argument concerns the sentence *if Pedro owns a donkey he beats it*, for which he provides the following first order formula (p.279):

(4-51) $(\forall x)$ (Donkey $(x) \wedge$ Owns (Pedro, x) $\rightarrow$ Beats (Pedro, x))

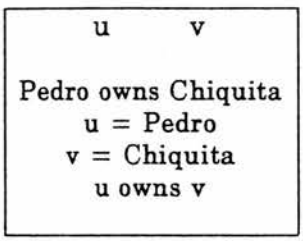
Kamp suggests that this is the most natural translation, but notes that some speakers disagree. It seems clear that the interpretation is at least possible, if not probable, and the problem is therefore that the indefinite specifier *a(n)* requires an interpretation involving universal quantification in this case while normally, as in *a donkey bayed*, requiring the existential quantifier in the logical representation. Kamp argues that this is unsatisfactory, and introduces DRT in an attempt to circumvent the problem and provide a uniform representation of the indefinite article.

4.5.2. Informal DRT

There are two main parts of a Discourse Representation Structure (DRS); a set of discourse markers which represents the referents of NPs and a set of conditions. A DRS is typically represented schematically as a box; for example,

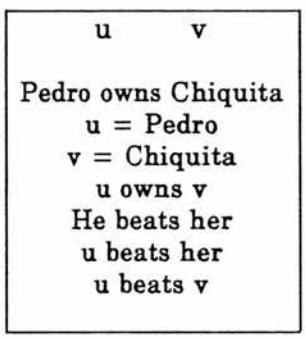
Kamp works through the discourse *Pedro owns Chiquita. He beats her* as follows; firstly a representation is built up for the initial sentence *Pedro owns Chiquita* (p.284):

(4-52)



Here *u* and *v* are used to label the discourse markers introduced by the NPs *Pedro* and *Chiquita*.[1] The conditions state the correspondences between the markers and the referents, and also the relevant relation. The information in the second sentence is then added to this DRS (assuming that the gender of the pronouns is used to make the appropriate anaphoric links) to produce the following expanded structure (p.284):

(4-53)



The information in this DRS can be checked against a formal model to ascertain truth or otherwise. Kamp sets out the requirements in the following statement (in which (4-53) has of course been substituted for the original):

[1] Kamp actually includes dots in DRSs and labels these with the markers; I shall assume that letters such as *u* and *v* in (4-52) are both labels and markers.

> If M is a model, representing the world - consisting of a domain U_M and an interpretation function F_M which assigns to the names *Pedro* and *Chiquita* members of U_M and to the transitive verbs *own* and *beat* sets of pairs of such members - then (4-53) is true in M iff the pair $<F_M$ *(Pedro)*, F_M *(Chiquita)*$>$ belongs to F_M *(own)* and to F_M *(beat)*. Moreover, the right hand side of this last biconditional is fulfilled if there is a map f of the universe of (4-53), i.e. the set $\{u,v\}$, into U_M so that all the specifications of (4-53) are satisfied in M - i.e., $f(u)$ is the individual denoted in M by *Pedro*, $f(v)$ is the individual F_M *(Chiquita)*, and it is true in M that $f(u)$ both owns and beats $f(v)$, in other words, that $<f(u),f(v)>$ belongs to both F_M *(own)* and F_M *(beat)*. (p.286)

A fuller statement of the model being assumed by Kamp is provided in the 1981 paper (pp.299-317). However, the latter sketch should serve to supply the necessary background for the account of definiteness which is suggested below. The main points to note are that DRSs are built up in an explicit manner by a construction algorithm which processes sentences and adds the necessary markers and conditions. The algorithm also determines the appropriate anaphoric links. The truth of the resulting DRS can be checked by attempting to discover suitable embeddings of the DRS in the model in the manner detailed in the latter quote from Kamp's paper. The process of determining the anaphoric links is clearly related to the familiarity version of definiteness, and the last part of this chapter introduces a possible account in these terms.

4.5.3. DRT and Definiteness

It should be emphasised, as pointed out in Zeevat (1989a) and in the discussion of Löbner above, that not all definite NPs can be described in terms of familiarity. However, many can, and DRT provides a framework in which familiarity can be modelled. Zeevat suggests the following general picture of the part of the DR construction algorithm which deals with definite NPs:

> At a certain point in the derivation we find an unexpanded definite description *the D* in an unexpanded expression *S(the D)* in a box *B* in the partial DRS *A* and we decide to deal with it. We now expand the (complex) noun *D* to obtain a DRS *D'*, separately, but as if it were in box *B*, with respect to *B* in *A*, identify a discourse marker *x* by means of one of the strategies and deal according to the same strategy with both *x* and *D'*. We then continue with *S(x)* in box *B*. (p.288)

Hence, for example, in processing a sentence such as *the donkey bayed*, an existing discourse marker is identified as the referent of the NP *the donkey* and this marker is effectively substituted for the NP in subsequent processing. There are five possible strategies which can be used to identify the marker, some of which are directly related to the list of conditionals suggested by Hawkins and presented in section 4.5. above. While Hawkins' work takes the speaker's rather than the hearer's position, there are clear correlations.

The first strategy proposed by Zeevat is stated as follows:

> a. We can prove on the basis of the information available in box *B* that there is only one thing which satisfies *D'* even if we do not have it available as an accessible discourse marker. If a discourse marker *x* satisfying *D'* is available we add *D'*(x) at the highest possible level, and proceed with processing *S(x)* in *B*.

This strategy is intended to capture what Zeevat terms the 'definition' and 'convention' uses of definiteness. The former refers to the typically Russellian examples such as *the king of France* and *the man who shot Reagan* in which the complex noun describes the object in a way which renders it unique. Just the cases, in fact, which Löbner used in criticising Russellian analyses because they were due to what he termed an "accidental" (p.19) property of the sortal nouns in question. The 'convention' cases are very similar. Typical examples are proper names and various related uses such as *the sun*, in which the total content of the expression is taken to identify a particular referent. Both these uses are clearly related to Hawkins' statements about entities being salient because of shared knowledge of some kind (either 'specific' or 'general'

knowledge).

The second strategy for processing definites is stated as:

> b. There is only one discourse marker x available in the current topic or extra linguistic context that on the basis of the information available in box B satisfies D'. It can be justified that no pronoun is used. We proceed with $S(x)$ in box B.

This covers anaphoric and demonstrative definites and relates to Hawkins' entities which are visible or in the discourse model. Sentences like *the man on the TV* and *the girl we were talking about* contain relevant candidates. The noun is sortal, but does not have a unary domain in general, as was the case with the previous category. It is unique in the context, and represents what Löbner called a functional concept which relates entities to situations.

The third strategy is:

> c. x is the most recent discourse marker in the present discourse part of the DRS that satisfies D'. We proceed with $S(x)$ in B.

This is the standard discourse anaphoric use which will be discussed in chapter 5 in relation to van Eijck's (1985) use of DRT.

The fourth choice in the algorithm for processing definites is:

> d. The background part of A concerned with the current context of discussion contains only one marker x that satisfies D'. Alternatively, there is nothing in that background part that tells us that there could not be such an x, we create one and add $D'(x)$ at the highest possible level seen from B. We proceed with $S(x)$ in B.

This corresponds with what Zeevat terms 'experiental' and 'communicational' definites, as found in sentences like *the computer is down again* and *the CO is ill*. There are a range of such uses, the notion being that some wider idea of context is necessary when the knowledge is shared by virtue of more than immediate visible context and/or discourse, although in something less general

than the whole context of language.

The fifth strategy is:

> e. The topic or the clause under development contains a marker *(x)* of which we can prove that it has a *D'*. Alternatively the topic or clause under development contains an *x* of which we can assume that it has a *D'*. We create a marker *y* and add it, has *(x,y)* and *D'(y)* to the highest possible level. We proceed with *S(y)* in *B*.

This deals with certain relational uses of definites in which the entity referred to is introduced tacitly into the context. Perhaps the most famous examples of this kind of thing are provided by Schank's 'Restaurant Script' (Schank and Abelson 1977), in which it is clear that reference to *the waiter* is felicitous without the noun having been used previously and without any visible evidence. Some of these uses are discussed by Löbner in terms of what he calls "configurations" (pp.40-44) of relations; for Hawkins the important fact in these cases is that there is an association with another entity in the discourse model. Such issues will not be discussed further in the present study.

4.6. Summary

The aim of this chapter is to introduce a general framework for handling definite reference; Discourse Representation Theory. While there a number of ways of implementing an account in this theory, I suggest that any method which assumes that reference to context is important is to be preferred, while accepting that not all definite NPs necessarily refer to the context of use. The section which introduced Zeevat's work will be assumed to provide an outline of a general algorithm for processing the definites which are contextual. In the following chapter this algorithm is assumed in order to process partitives in a version of DRT which is based on the work of van Eijck (1985).

One important problem with the DRT account of definiteness must be

mentioned, however. As noted in introducing the theory, the algorithm for processing sentences and determining anaphoric links assumes that sentences are parsed and given a semantic analysis before they are added to the developing discourse model. In order to account for the infelicity of sentences such as (4-54) below, this process must be changed:

(4-54) *? The teacher was hired who had the right attitude to children

I have been assuming that it is the definiteness of the subject NP which explains the grammaticality contrast between (4-54) and (4-55) below:

(4-55) A teacher was hired who had the right attitude to children

However, in order for this explanation to be viable, it must be assumed that the process of determining anaphoric relations is incremental. The argument is that the description contained in the NP *the teacher who had the right attitude to children* picks out an existing discourse referent, and the ungrammaticality of (4-54) is due to the splitting up of this description. The 'unextraposed' part of the NP, *the teacher*, does not refer itself, and so my argument is that the process of the DR construction algorithm should be complicated due to the need to wait for the later disambiguating material. Very similar points are made in Haddock (1988, 1990) in which incremental interpretation is shown to account for certain PP attachment ambiguities through the use of strategies such as the 'Principle of Referential Success' (Crain and Steedman, 1985) and the 'Principle of Referential Support' (Altmann and Steedman, 1988). For present purposes it must suffice to state that the DRT approach must be altered to allow for incremental interpretation along the lines of these latter papers and that such alterations will allow an account of the infelicity of sentences such as (4-54). This issue is discussed further in the following chapter.

Chapter 5

Plurals

5.1. Introduction

The previous chapter dealt with the question of the semantic characterisation of definiteness. This chapter attempts to provide a semantics for another important feature of language; plurality. There are many interesting questions about the semantics of plurals which remain to be solved, some of which relate directly to partitives, and I shall begin by introducing the work of Link (1983, 1986a, 1986b) in which a lattice-theoretical approach is assumed. The account of plurals in DRT in van Eijck (1985) is also investigated briefly and a few amendments are suggested to take account of some of Link's proposals. Finally, the SIP syntactic rules are associated with semantic operations as described in chapter 4.

5.2. A Logic of Plurals and Mass terms

Link develops the formal language LPM (The Logic of Plurals and Mass Terms) in order to give a uniform account of the semantics of plural and mass nouns. As I mentioned in the last chapter in discussing Ladusaw's (1982) amendment to generalised quantifiers, Link's approach is similar in some ways to Ladusaw's, and I shall relate the accounts explicitly where this seems useful.

One reason for supplying a uniform account of plural and mass terms concerns the property of 'cumulative reference' which they both exhibit. An example of this property is provided by sentences such as:

(5-1) If there are books on the first shelf and books on the second shelf, then there are books on both shelves.

Similar facts are true of mass terms:

(5-2) If there is water in your shoe and water in my shoe, then there is water in our shoes.

Link's use of lattice theory allows a general statement of this and also, for example, means that a single account of the definite article *the* can be given which covers singular and plural occurrences. I shall concentrate below on the use of lattice theory in analysing collective predication; a discussion of further advantages can be found in Link (1983). Also, having noted the relationship between mass and plural nouns, I shall focus on the account of plurals, as Link does in his later papers, and assume that the analysis of mass terms in LPM is correct.

5.2.1. Plural Individuals

One important justification for Link's system concerns the phenomenon known as collective predication. These predicates suggest that at least some plural nouns actually denote individual entities in some sense. Examples from Link (1983) are (p.302):

(5-3a) The children built the raft.
(5-3b) The Romans built the bridge.
(5-3c) The playing cards are scattered all over the floor.
(5-3d) Mary and Sue are room-mates.
(5-3e) The girls hated each other.

The argument is that the predicates in (5-3) can, and in some cases must, operate on the NPs as individuals and not specifically on the actual members of the sets involved. Thus in (5-3a) it is possible for there to be some children who did not actually take part in the activity of building the raft. The activity is

predicated of the set as a whole. It is also possible, of course, for the sentence to be read as *all the children built the raft*, but this is not the case with examples (5-3c)-(5-3e), in which it is never possible to give a distributive reading in the sense that the predicate cannot be applied individually to every member of the set in question. Thus the sentences below are ill-formed:

(5-4a) * The card was scattered all over the floor.
(5-4b) * Mary is a room-mate.
(5-4c) * The girl hated each other.

Link's general approach is characterised by his opposition to what he calls "reductionist ontological considerations" which he feels are "quite alien to the purpose of logically analyzing the inference structures of natural language" (Link 1983. p.303). He suggests that:

> If we have two expressions (a) and (b) that refer to entities occupying the same place at the same time but have different sets of predicates applying to them, then the entities referred to are simply not the same. (p.304)

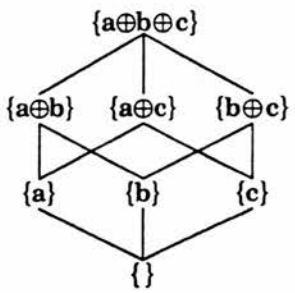
As an example of this, he adduces the behaviour of certain collective nouns. In the case of a deck of cards, while the cards and the deck which they constitute are made up of the same portion of matter, they do not denote the same individual. In the same way, a committee is "not just the collection of its members" (p.304). There are therefore two distinct types of individual, plural individuals (*the men*), and atomic individuals (*the man*), which have the same semantic type. This distinction is captured in the formal model, which is investigated below.

5.2.2. Formal Approach

Link proposes a lattice theoretical approach to NP semantics; the necessary background to lattice theory can be found in Grätzer (1971). Link defines a

domain of discourse which is internally structured, and this is done by introducing a two-place relation $\vee_i$ which operates on E, the set of individuals, to produce individual sums (i-sums). This means that the ordered pair $<E,\vee_i>$ forms a semi-lattice. The syntactic counterpart of the semantic i-sum operator is the circled plus $\oplus$. Link suggests that it is convenient for the lattice structure to be closed under the i-sum operator to make it complete. The insistence on closure allows him to introduce an abstraction operator for arbitrary one-place predicates, σ, which constructs terms of the form $\sigma x P x$. This denotes the i-sum of all individuals that are Ps; in other words the supremum of the (sub)lattice denoted by P. Thus, for example, the denotation of a common noun such as *student* is a partially ordered set (poset) containing all possible groups of students, including the atomic individuals.[1] To take a concrete instance, where a, b and c are individual variables and the set $\{a, b, c\}$ represents the students in the domain, then the denotation of **student* is the poset below:

(5-5)



The partial ordering relation $\vee_i$ is represented by the lines connecting the individuals. This poset will be used below to illustrate some important points; I shall occasionally refer to (5-5) as S and represent it using the set {a⊕b⊕c, a⊕b, a⊕c, b⊕c, a, b, c, ∅}. I should also note here that I have simplified matters slightly. Link actually distinguishes 'proper' plurals which do not

[1] From now on I shall typically use 'lattice' in place of 'complete join semi-lattice' in the interests of concision. Also, I shall occasionally refer to the sets of individuals as 'lattices', where 'poset' would be more accurate. If the order is assumed to be implicit in the set, there should be no danger of confusion.

contain the atomic individuals in their translations. The denotation of *student* is therefore more accurately given by $\|^{\circledast}student'\|$ where $\circledast$ is like the * operator but where the resulting lattice does not contain the atomic individuals. This kind of distinction is not immediately relevant for present purposes, and in the interests of simplicity I have ignored the distinction here and in similar contexts below. The main point to note is that latterly Link provides a version of his theory in the generalised quantifiers framework (Link 1986a) in which the translation of NPs is, of course, different. The following section discusses this later approach.

5.2.3. Lattice Theory and Generalised Quantifiers

Making the basic lattice-theoretical approach compatible with generalised quantifiers is relatively straightforward, although I will argue below that the result is not necessarily the best framework for providing an account of the semantics of partitives. However, the denotation of *some students* in LPM with generalised quantifiers is given in Link (1986a) as:

(5-6) $\|some\ students\| = \{ X \subseteq E \mid X \cap \|^{*}student\| \neq \varnothing \}$

One-place predicate terms such as *think* will, like common nouns, denote lattices, and so the truth or falsity of a sentence such as *some students think* will depend on whether or not the poset denoted by *think* is a member of the set of such sets which represents *some students*. To spell this out, let us assume that the denotation of *think* is represented by {a⊕b, a, b, ∅} and the denotation of *sing* by {b⊕c, b, c ∅} and also that these are the only predicates in the model. Thus given (5-6), the denotation of *some students* is the set of posets whose intersection with $\|^{*}student\|$ is non-null. Given the previous representation for $\|^{*}student\|$ as S above, the relevant set of predicates will therefore be:

(5-7) $\|$*some students*$\|$:
{ {a⊕b, a, b, ∅}, {b⊕c, b, c, ∅} }

I shall assume that the important sets in the NP denotations are the predicates and ignore the others for present purposes. As discussed in chapter 4, in the generalised quantifier framework NPs denote quantifiers and VPs set terms. Barwise and Cooper state the requirements for the truth of sentences as follows (1981, p.171):

> If Q is a quantifier and ψ is a set term then Qψ denotes true or false depending on whether or not the denotation of ψ is one of the sets in the denotation of Q, i.e.,
>
> $\|Q\psi\| = 1$ if $\|\psi\| \in \|Q\|$, 0 if $\|\psi\| \notin \|Q\|$

The truth value of the sentence *some students think* can now be ascertained. According to Barwise and Cooper's definition, this depends on whether or not $\|$*think*$\| \in \|$*some students*$\|$. Looking at the relevant denotations, it is clear that {a⊕b, a, b, ∅} is a member of the set in (7), and so the sentence is true.

As for the definite article, the translation of *the students* in Link (1986a) is given as (p.13):

(5-8) $\|$*the students*$\| = \{ X \subseteq E \mid \sup_i \|$**students*$\| \in X \}$

The term $sup_i(P)$ picks out the supremum in the lattice. The standard definition of this is stated in Grätzer (1971, p.2); note that P is any set with a partial ordering (i.e. lattice):

> Let $H \subseteq P$, $a \in P$. Then a is an *upper bound* of H if $h \leq a$ for all $h \in H$. An upper bound a of H is a *least upper bound* of H or *supremum* of H if, for any upper bound b of H, we have $a \leq b$.

As mentioned above, Link (1983) uses the term σxPx to represent the individual in question, and he defines this slightly differently, as shown below:

(5-9) $\sigma xPx = ix [*Px \wedge \forall y (*Py \rightarrow y \sqcap x)]$

Here Π stands for a two place predicate constant which means 'is an individual part of' and which is the semantic correlate of the partial order $\vee_i$. The definition in (5-9) will pick out the one individual in the lattice **P* of which all other individuals are sub-parts. Assuming that the lattice in (5-5) represents the relevant contextually defined object, then the statement in (5-9) will pick out the 'top' element, i.e. a⊕b⊕c. The denotation of the NP *the students* is therefore the set of posets which contain this element.

Before looking at partitives in this framework, it should be noted that Link's system does have a number of features which are directly comparable with Ladusaw's (1982) proposals as outlined in chapter 4. When Link lifts his treatment of NP semantics into GQ, his approach to collective properties is similar to Ladusaw's. The denotation of a conjoined NP like *John and Mary* is the principal filter (as defined in chapter 4) which is generated by the plural sum *John*⊕*Mary*. Unlike Ladusaw's analysis, however, Link's treatment means that *and* is not normally ambiguous, although he argues that it is necessary to retain Boolean *and* for NPs like *John and every other student*. He suggests that the latter example should be treated in the standard GQ way (as the intersection of the two filters) because plural structures are not really involved (1986a. p.8). The distinction between collective and distributive readings which Ladusaw (1982) noted can be handled in LPM by stipulating that distributive predicates should be closed under sub-sums. Thus a predicate like *are students* will contain atoms corresponding to the individual students, with the result that such a predicate will itself be a member of the intersection of the filters generated by the individuals. Thus the truth conditions for sentences involving these predicates do not in themselves require *and* to be ambiguous, and the result of all this, as Link points out, is that:

> We start out with an analysis in terms of sums, and when we happen to meet a distributive predicate we are able to get down to the level of atomic predication. (1986a, p.7)

5.2.4. Lattice Theory and Partitives

Link has proposed that partitives should be handled using the individual part relation (Link 1986a, p.3). He does not actually provide a complete analysis in the latter paper, and so the following is an attempt to work out the necessary details. In order to outline exactly what is happening in this section, I shall repeat the step by step working of an example as was done in section 5.2.3. Thus I shall assume the example posets representing *student, think*, and *sing* as given previously, and assume further that the poset representing *gather* is {a⊕b⊕c, a⊕b} (which does not contain atomic individuals as the predicate is collective). The full details of these sets are therefore:

‖**student*‖ :
{a⊕b⊕c, a⊕b, a⊕c, b⊕c, a, b c, ∅}

‖**think*‖ :
{a⊕b, a, b, ∅}

‖**sing*‖ :
{b⊕c, b, c, ∅}

‖**gather*‖ :
{a⊕b⊕c, a⊕b}

One further poset is required, in this case representing a particular subset of the set of students. Let us assume that the subset, which I shall refer to using the term 'students.def', contains the individual students 'a' and 'b'. This means that the denotation of the subset is (accidentally) identical to *think*:

‖**students.def*‖ :
{a⊕b, a, b, ∅}

Assuming now that a uniform semantics for specifiers is desirable, then taking

some as an example, the following representation should cover simple NPs and partitives:

(5-10) $\|some\|(A) = \{ X \subseteq E \mid X \cap A \neq \varnothing \}$

This is the standard generalised quantifier translation, which Link assumes. As discussed in chapter 4, (5-10) states that the denotation of *some(A)* is the set of sets whose intersection with A is non-null. In the present context, of course, A is the poset representing the common noun, and so in order to preserve this representation for specifiers in partitives, the partitive phrase must also denote a poset, i.e., *of the students* in *some of the students* must denote a partially ordered set. In (5-8) above the following translation was suggested for *the students*:

(5-8) $\|the\ students\| = \{ X \subseteq E \mid \sup_i \|^*students\| \in X \}$

This is the set of all posets which contain the supremum of the set denoted by the (contextually defined) set of students. Assuming that this subset is the denotation of *students.def* as given above, then (5-8) will denote the set of posets which contain the supremum of this subset, i.e., the sets which contain a⊕b. Let us assume for simplicity and concision that only the predicate terms are relevant. This means that the denotation of *the students* will include the set of predicates below:

(5-11) { {a⊕b, a, b, ∅}, {a⊕b⊕c, a⊕b} }

Barwise and Cooper, as discussed in chapter 4, propose the following semantics for *of NP* (cf. 1981, p.207):

$\|of\ NP\| = \cap \|NP\|$

Applying this operation in the present case means that *of the students* will

denote intersection over the set of posets in (5-11), and this gives the result below:

(5-12) $\{a \oplus b\}$

This is the correct semantic type for common nouns, being (minimally) a set of individuals. However, another operation is required in order to produce the correct semantics for *some of the students*. Given (5-12) as the denotation of *of the students* and the standard translation of *some* as in (5-10) above, the meaning of the NP will be represented by the expression below:

(5-13) $\|some\| (\|the\ students\|) = \{ X \subseteq E \mid X \cap \{a \oplus b\} \neq \varnothing \}$

The denotation of *some of the students* is therefore the set of all lattices which contain $a \oplus b$, which is identical to the set representing *all of the students*. It is clear that this representation is wrong; the sub-parts of (5-12) should also be included in the representation. To spell this out, note that in a situation in which the denotation of *of the students* is a larger individual, say $a \oplus b \oplus c \oplus d$, then the semantics suggested above for *some* means that *some of the students* cannot denote the set of lattices containing $a \oplus b \oplus c$, which is obviously wrong. Hence another operation is necessary.

In discussing numerals Link argues that the denotation of a partitive phrase such as *of the three men* must denote the set of all the individual parts of the three men (Link 1986a, p.20). The set L of individual parts of an individual I can be formed as follows:

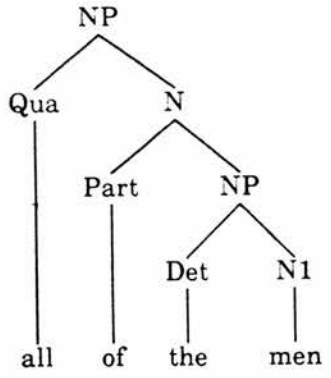
(5-14) $L(I) = \{x \mid x \sqcap I\}$

Thus, combining the two proposed operations, the mapping from the denotation of *the students* to the denotation of *of the students* must be represented as something like:

(5-15) $\|of\ NP\| = \{x \mid x\ \Pi\ (\cap\ \|NP\|)\ \}$

This seems the most likely interpretation of Link's suggestion that partitives can be analysed in terms of individual parts. As mentioned above, he does not explicitly state how the denotation of the partitive phrase is to be specified, but the above formulation is the standard generalised quantifier representation, as discussed in chapter 4. Link does provide a tree diagram for the NP *all of the three surviving men* in order to illustrate his approach to the semantics of numerals (p.19). Ignoring the numeral and the adjective, which are irrelevant for present purposes, the structure below would be assigned to *all of the men*:

(5-16)



$\lambda P\ \forall x [[\ x\ \Pi\ \ \sigma y\ \ \ man(y)] \rightarrow P(x)]$

In some ways (5-16) looks like the standard generalised quantifier analysis in which *of NP* is treated as a common noun as detailed in chapter 4. However, the logical formula in (5-16) implies that the semantics of *of* is represented simply by the individual part operator, and this cannot be the case. Given the semantics for *the* as in (5-8), then at least one further operation must be associated with *of* in order to produce the common noun denotation from the partitive phrase; set intersection as employed by Barwise and Cooper is necessary.

Another point about the formula in (5-16) is that it suggests that specifiers take individuals as arguments; the term ($x\ \Pi\ \sigma yPy$) denotes an individual. This is

not, of course, the standard assumption in the generalised quantifier framework. As we have seen, specifiers are functions over sets, and so another operation is necessary if Link is to provide the same semantics for the specifiers in simple and partitive NPs. Generating the poset from the individual using the formula in (5-14) will produce the required result.

One question which is worth investigating at this point is why definite NPs are given the representation in (5-8) above, and the answer is that Link is making his analysis compatible, to some extent, with the Russellian account of definite reference. As discussed in chapter 4, the essence of this account is that there is a unique object in the context which satisfies the description, and this is often symbolised as $ixPx$ which is to be interpreted as shown below:

(5-17) $ixPx = ix [Px \wedge \forall y (Py \leftrightarrow x = y)]$

This can be compared with Link's definition of σxPx which was stated in (5-9):

(5-9) $\sigma xPx = ix [{}^*Px \wedge \forall y ({}^*Py \rightarrow y \sqcap x)]$

Link points out that (5-9) and (5-17) are equivalent where x is an atomic individual; in other words, σxPx is the generalisation of $ixPx$ which covers all individual sums. It was argued in chapter 4 that the Russellian account should be modified, and that the introduction of a formal account of the role of context provides a more satisfactory framework for defining definiteness. It is therefore worth looking at the question of what a combination of lattice theory and DRT might look like, and the following section does this while attempting to preserve the uniform representation of the specifiers in simple and partitive NPs which is arguably the root of the complications in my interpretation of Link's account.

Before leaving the details of lattice theory it is useful to summarise some points about the approach. Firstly, it must be emphasised that the use of lattices

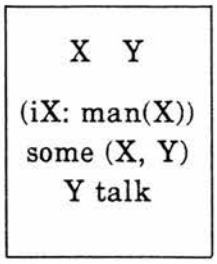
allows an intuitive analysis of certain natural language phenomena, such as collective predication, which may otherwise be highly problematic. The theory also allows a more or less uniform treatment to be given to mass and count nouns, as described in detail in Link (1983). It was mentioned above that it is being assumed here that the treatment of mass nouns in the latter paper is correct, and hence denotations can be supplied for NPs such as *a little wine* and *much of the water* alongside *a few people* and *many of the students* using formal representations for the quantifying expressions such as those discussed above. Another advantage is that the approach allows a single account of the semantics of the definite article with plural and singular nouns. Finally, it should be noted that the complications surrounding the semantics of partitives cannot be understood as an argument for Barwise and Cooper's (1981) representation; Link is attempting to handle data concerning collective predication which Barwise and Cooper, as they point out, cannot explain.

5.3. Plurals and DRT

This section looks briefly at van Eijck's (1985) account of plurals in DRT. There are a number of points where his account diverges from the approaches to semantics which are discussed above. Notably, he assumes that VPs denote functions over NPs; although this option is adopted in GPSG85 (pp.191-192), it has not been considered so far here. However, the details of this issue need not concern us; the most important point is to see how van Eijck's treatment of quantifiers might be adapted to assimilate the lattice-theoretical approach.

Various arguments are presented by van Eijck to the effect that DRT should allow two kinds of discourse marker to represent singular and plural objects (pp.314ff). He then exemplifies the use of plural markers by analysing the sentence *some men talk*, which is given the following DRS (p.316):

(5-18)



Upper case letters are used for plural markers and lower case for singulars. The expression *(iX: P(X))* is to be added to the DRS language; it is used to pick out the maximal set denoted by the predicate *P*. In effect, then, the common noun denotation is added to the DRS. Also, *some (X,Y)* is a new type of formula which is verified by the condition below (cf. p.317):

(5-19) *f* verifies *some(X,Y)* in <E,F> iff $f(Y) \subseteq f(X) \wedge f(y) \neq \varnothing$

Where F is the evaluation function. The representation in (5-19) means that *some(X,Y)* will be verified iff *Y* is a non-empty subset of *X*. In order to account for various problems concerning specifiers such as *every* and *many*, van Eijck introduces a range of mechanisms such as distributive diacritics on DRS markers and a new kind of DRS 'splitting' algorithm (pp.317ff). He argues that his account provides a satisfactory interpretation for various examples which standard DRT cannot handle (p.322-323); for instance, sentences like *many a farmer who owns a donkey beats it* may be given the wrong truth conditions in the standard theory. The account which van Eijck proposes necessitates a new formulation of DRS embedding conditions, and he takes some care to state the requirements precisely (p.319). Again, I shall ignore these matters in the interests of translating the basic approach into a system which assumes that the domain of discourse is formalised using lattice theory.

Firstly, it is worth noting that, outside the generalised quantifier approach, the

following representation was suggested for *some of the students* in Link (1986b, p.37):

(5-20) $\exists x\,[x \sqcap \sigma y\ student'(y)]$

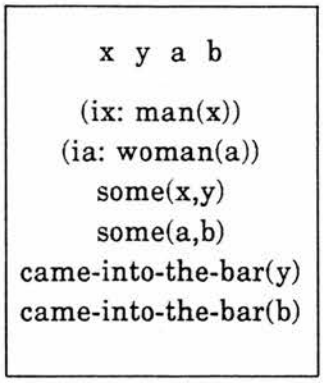
This expression picks out an individual which is a part of the supremum of the lattice representing *the students*. The suggestion is therefore that such individuals should be substituted for van Eijck's plural markers which means, of course, that there is no need to distinguish between plural and singular elements in DRSs as they are all now partially-ordered individuals. As for the specifiers, the verification conditions for *some* which were proposed above can easily be adapted to take account of the lattice structure:

(5-21) f verifies $some(x,y)$ in $<E,F>$ iff $f(y) \sqcap f(x) \wedge f(y) \neq \varnothing$

In this case, the model will verify $some(x,y)$ iff y is an individual part of x. Mutatis mutandis, this is identical to Link's analysis of partitives formed using *some* outside the generalised quantifier framework (Link 1986b) which was given in (5-20) above.[2] The suggestion here is that partitives can be handled in a very straightforward way in this system. The definite article, in both singular and plural individuals, indicates that the individual is to be found using one of Zeevat's strategies as described in chapter 4. A specifier can be applied to this individual exactly as it would apply in a simple NP. For example, after processing the sentence *some men and some women came into the bar*, the following DRS will be built:

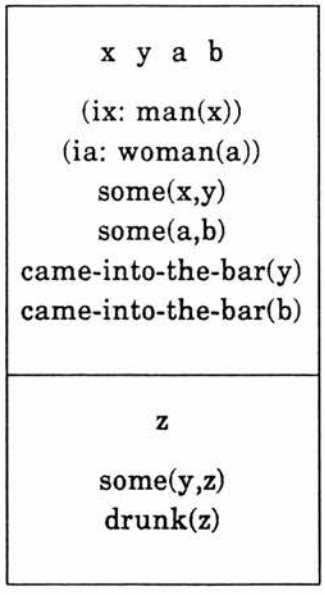
[2] The existential quantifier which appears in (5-20) is implicit in the DRT representation; see Kamp (1981) for details.

(5-22)



A subsequent sentence such as *some of the men were drunk* will produce the following representation:

(5-23)



Thus the definite article has signalled to the DRS construction algorithm that an individual is to be found matching the description *man(x)*. A marker is then added and the further (atomic) conditions are also added along with the relation representing the specifier denotation. It should be noted that the standard construction algorithm might actually stipulate that the specifier *some* introduces two new markers in the lower box in (5-23). A statement would then

be added to the DRS to the effect that one of these markers is identical to *y* in the top box; the DRSs in (5-38)-(5-41) below exemplify this approach. However, the resulting truth conditions are the same.

Note also that there are two markers which satisfy the condition *man(x)* in (5-23); both *x* and *y* in the top box are men. As van Eijck argues, this is actually an advantage in that some anaphoric references are to the common noun denotation and similar to generics in interpretation. Thus the following kind of discourse is relatively common:

(5-24) Some men were drinking at the bar. They can be real pigs.

One of the justifications which van Eijck suggests for his account is that the standard introduction of a marker for the common noun allows this kind of anaphora. The construction algorithm, of course, must be designed in such a way that the search for antecedents is ordered; the details of how this should be done must be left aside here except for the comment that the operation is clearly very complicated, involving a large range of pragmatic and focus effects.

In conclusion, the short introduction to van Eijck's work is partly an attempt to justify Link's (1986a) suggestion that DRT might provide a suitable framework for handling definite reference when the domain of discourse is represented using partially ordered sets. However, the actual account differs from Link's own suggestion as it was argued above that the generalised quantifier approach to the semantics of the definite article results in an unsuitable representation for *of* in partitives. The proposed semantic operations for the SIP syntax rules which are detailed below assume that a strategy such as the one just sketched for identifying existing individuals must be associated with definiteness.

5.4. Syntax and Semantics

The aim in this section is to show how the syntactic rules in the SIP grammar might be given a semantics along the lines of the GPSG approach which was described in chapter 4, taking into account some of the issues which were discussed above. The syntax rules are classified below and the section ends with a GPSG/PTQ style representation of the syntax and semantics of the NP *some of the men* in both the generalised quantifiers version and the form which is proposed here.

5.4.1. The Semantic Operations

The SIP grammar which was presented in chapters 2 and 3 contains thirteen high level rules, and these can be grouped into certain classes for the purposes of semantics. Firstly, however, I will have nothing to say about the semantic properties of adjectives; my main concern is to relate the specifier and demonstrative rules to a semantics. The **N1 → AdjP N1** and **AdjP → Int Adj** rules are therefore ignored. Looking at the remaining rules, these can be grouped into four types, as shown below:

Specifier:

(5-25) NP → SpecP N1

Empty Specifier:

(5-26a) NP → N1[+Def]
(5-26b) NP → N1[+Mass]

Demonstratives:

(5-27) N1 → Det N1

Semantic Identity:

(5-28a) N1 → N
(5-28b) N1 → P N1
(5-28c) SpecP → Spec
(5-28d) SpecP → AdjP
(5-28e) SpecP → QDet N1
(5-28f) SpecP → QDet AdjP
(5-28g) SpecP → Spec Adj

Assuming a GPSG85-style pairing of syntax and semantics as introduced in chapter 4, the following rules supply the necessary information (cf. (5-25)):

(5-29) <NP → SpecP N1; SpecP′(N1′)>

The specifier rule in (5-29) behaves in the normal fashion; the specifier denotes a function over N1 denotations. However, in the present system the N1 argument can be either definite or indefinite. As for the denotation of the specifiers themselves, the semantic representations suggested by van Eijck for *some* which was adapted in (5-21) above can be taken as a model. The worked example below in which *some of the students* is analysed provides both a generalised quantifier and a van Eijck style account.

The two empty specifier rules are given the same semantics, as shown below (cf. (5-26)):

(5-30a) <NP → N1[+Def]; $\lambda Q \exists x[N1'(x) \wedge Q(x)]$>
(5-30b) <NP → N1[+Mass]; $\lambda Q \exists x[N1'(x) \wedge Q(x)]$>

It is not necessary to posit an actual empty element in (5-30a) and (5-30b); the semantics can be associated directly with the rules. It will be stipulated below that items such as the QDet and case-marking *of* play no rôle in the semantics, and so there is no particular advantage in inventing an empty category for the rules in (5-30) just to avoid associating the semantics with the rule rather than with a lexical element. Note that I shall sometimes use the set notation which

was introduced in discussing Barwise and Cooper (1981) and Link (1986a) rather than the lambda calculus representations in (5-30). GPSG85 employs the latter throughout, but it may be less confusing here to use the set-style expressions on occasion for the items which have already been discussed as these should be familiar.

One point to note about the empty specifier rules is that the pairing of the definite and mass (singular and plural) rules may explain the correspondence between uses such as those in (5-31) below:

(5-31a) People were very shocked by the trade figures
(5-31b) The children helped with the cooking

In both cases the interpretation may be that not all of the set in question satisfies the predicate. One way to do this for bare plurals was suggested in Link (1983) where the empty specifier is given exactly the same semantics as *some* (cf. p.318):

(5-32) $\|\varnothing_{pl}\| = \lambda Q \lambda P \exists x[Q(x) \wedge P(x)]$

There is no reason to believe that Link wishes the null specifier to be distinguished in the generalised quantifier framework. The bare plural would subsequently denote the same set of predicates as those in (5-6) above:

(5-6) $\|students\| = \{ X \subseteq E \mid X \cap \|^*student\| \neq \varnothing \}$

The truth of a sentence such as (5-33a) below, therefore, will depend on whether or not the lattice representing the predicate *carried the piano* is a member of the set denoted by (5-6):

(5-33a) Students carried the piano
(5-33b) Dealers in the foreign exchange markets have long faces today
(5-33c) Elephants carry their young for over a year

As (5-33c) shows, one form of this kind of predication is generic, and it seems that the interpretation is similar to the others in that (5-33c) does not entail that all elephants have pregnancies. The question is now whether the definite empty specifier rule should be given the same semantics; in other words, whether or not the interpretation of (5-34b) below should be the same as *some of the dealers*:

(5-34a) People were very shocked by the trade figures
(5-34b) The dealers were very shocked by the trade figures

The predicate does seem to have the same interpretation in (5-34a) and (5-34b), and it is arguable that scoping *some* over the subject nominals produces suitable representations. However, taking Link's (1983) analysis of collective predication as a model, it would also be possible to account for the similarity by representing the semantics of *people* and *the dealers* in (5-34a) and (5-34b) using the suprema of the relevant lattices. As with the obviously collective predicates such as *gathered*, the denotation of *were very shocked by the trade figures* could be applied to the individual which represents the join of the whole set and, in the same way that the collective predicates need not refer to each atomic individual, the interpretations of the sentences in (5-34) could be specified correctly. In general, therefore, it is possible to accept that the empty specifier rules do not have the same semantics as *some* while arguing that the semantics of bare plurals and definites have common elements. It should be noted here that there is a wide-ranging discussion of bare plurals in Carlson (1977) and Link (1986b).

The semantic rule for the demonstratives is (cf. (5-27)):

(5-35) $<\text{N1} \rightarrow \text{Det N1};\ \lambda x[\text{N1}'(x) \wedge \mathbf{def}(x)]>$

The type of the determiners is therefore $<<e,t>,<e,t>>$, i.e. functions from

common noun denotations to common noun denotations. This is the same type as is usually given to adjectives, and similar proposals were sketched in Ladusaw (1985). Where an N1 such as *tedious thesis* would be represented by λx[**thesis**$'(x) \wedge$ **tedious**$'(x)$], the demonstratives simply add the information that the N1 is definite. This specification will subsequently be interpreted as the required signal to the DRS construction algorithm which will look in the discourse context for a marker satisfying the description N1$'(x)$.

Although this is the simplest implementation, it is not without problems, one of which concerns the notion of compositionality. I can do no more here than point to some discussion of this matter in Zeevat (1989b) in which an attempt is made to define compositionality in DRT. I should also note that, as suggested in chapter 4, such an approach cannot easily be used to account for the difficulty in interpreting certain extraposition examples because the entire sentence is analysed before the referents are identified; the suggestion that extra processing load is required when a definite description is fragmented cannot be modelled properly in such a system. Again, it may be that adapting DRT to take account of research on incremental interpretation would provide the required model.

As for the semantic identity rules, the interpretations are simply represented by one of the daughter's semantics (cf. (5-28)):

(5-36a) <N1 → N; N'>
(5-36b) <N1 → P N1; N1'>
(5-36c) <SpecP → Spec; Spec'>
(5-36d) <SpecP → AdjP; AdjP'>
(5-36e) <SpecP → QDet N1; N1'>
(5-36f) <SpecP → QDet AdjP; AdjP'>
(5-36g) <SpecP → Spec Adj; Spec'>

In each case, therefore, the rule is an identity function. In the first, third, and fourth rules, with only one daughter, the operation is clearly trivial. In (5-36e) and (5-36f), no semantics will be associated with the QDet, and so the semantics

must come from the N1 and AdjP respectively. Similarly, the preposition has no semantics in the case-marking rule (5-36b). The most contentious case is (5-36g), which is used to analyse NPs such as *every one of the men*; it is not clear that the semantics of such examples can always be attributed solely to the specifier. However, for most cases it is adequate. The following section now looks at some example semantic derivations to illustrate the operation of some of the proposed rules.

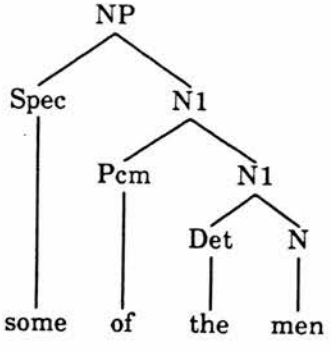
5.4.2. Example Derivations

This section works through the representations of the NPs *some of the men* and *the men* using the syntactic and semantic rule pairs given in (5-29)-(5-36) above. It should be noted that the entities (type *e*) are lattice individuals rather than atomic set elements.

The syntactic analysis of *some of the men* which was proposed in chapter 2 is:

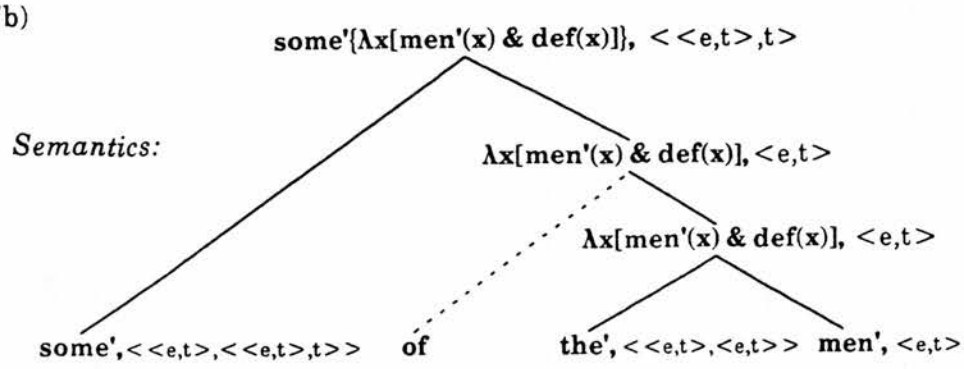
(5-37a)

Syntax:



The associated semantic tree is:

(5-37b)



The derivation in (5-37b) shows three types of semantic rule; the demonstrative type, the 'vacuous' rule and the specifier rule. The dotted line indicates that *of* takes no part in the semantics; the lexical entries will specify the following translations for the other lexical items:

men'	$\|\|^*men\|\|$
the'(A)	$\lambda P \lambda x[P(x) \wedge \mathbf{def}(x)]$
some'(A)	$\lambda Q \lambda P \exists x[P(x) \wedge Q(x)]$

It was noted above that the semantic type associated with *the* is that of an adjective, as proposed in Ladusaw (1985). The lambda calculus translation of *some* is taken to be $\lambda Q \lambda P \exists x[Q(x) \wedge P(x)]$ as shown. This is compatible with the set-style translation provided earlier in (5-10):

(5-10) $\|some\|(A) = \{ X \subseteq E \mid X \cap A \neq \varnothing \}$

In fact, the lambda calculus translation for *some* is identical to the empty specifier denotation which was given in (5-32) above. However, assuming that membership of the poset denoted by $\|^*men\|$ is equivalent to the predication $\|^*men\|(x)$, then the elements in the tree in (5-37b) will combine as follows if the semantics of the NP is to be a standard generalised quantifier:

the'(men')		$\lambda P \lambda x[P(x) \wedge \mathbf{def}(x)] \{ \|^*men\| \}$
	=	$\lambda P \lambda x[\|^*men\|(x) \wedge \mathbf{def}(x)]$
some'(the'(men'))		$\lambda Q \lambda P \exists x[P(x) \wedge Q(x)] \{ \lambda P \lambda x [\|^*men\|(x) \wedge \mathbf{def}(x)] \}$
	=	$\lambda P \exists x[\|^*men\|(x) \wedge \mathbf{def}(x) \wedge P(x)]$

The final expression above will combine with a predicate such as *walk* and the result will be the formula below:

$\exists x[\|{}^*men\|(x) \wedge \mathbf{def}(x) \wedge \|{}^*walks\|(x)]$

Assuming that the specifier operates in the manner suggested by van Eijck, an account can be sketched of the final representation in the tree in (5-37b) which expands on the latter expression. Let us assume that there is an existing DRS which represents the sentence *some students came into the bar:*

(5-38)

x y
(ix: students(x)) some(x,y) came-into-the-bar(y)

Given the semantic representation of *some of the students* as in (5-37b), the sentence *some of the students were drunk* would be added as follows. Firstly, the specifier works in the normal manner, adding two markers and a formula to the DRS extension:

(5-39)

x y
(ix: students(x)) some(x,y) came-into-the-bar(y)
u v
some(u,v)

Now the expression $\lambda x[\mathbf{men}'(x) \wedge \mathbf{def}(x)]$ signals to the construction algorithm that a marker satisfying $\mathbf{men}'(x)$ is to be identified. Using Zeevat's third strategy as defined in chapter 4, the marker u will be equated with y, and the result can be represented as below:

(5-40)

x y
(ix: students(x)) some(x,y) came-into-the-bar(y)
u v
some(u,v) u = y

Finally, the predicate *were-drunk* will be added:

(5-41)

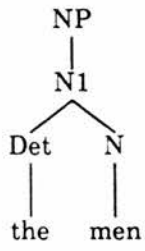
x y
(ix: students(x)) some(x,y) came-into-the-bar(y)
u v
some(u,v) u = y were-drunk(v)

The difference between the uses of *some* in the first sentence (*some students came into the bar*) and in the second (*some of the students were drunk*) is

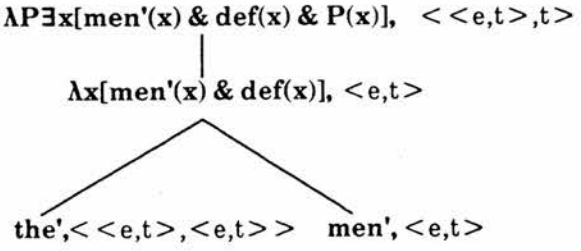
therefore entirely due to the definiteness specification on the N1. The specifier actually behaves identically in the two cases.

To conclude the illustration of the SIP semantics, the fourth kind of rule, the 'empty specifier' case, is shown as it would appear in the analysis of *the men* as an NP:

(5-42a)



(5-42b)

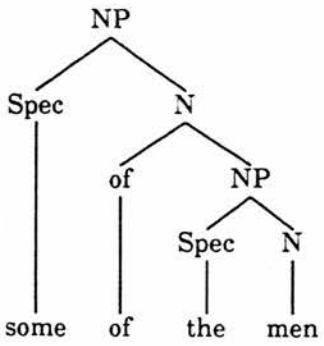


Similar representations would be given to bare plurals. The type raising operation is shown here to be identical to the application of *some* to *the men* as detailed above. Thus the interpretation of the 'empty specifier' as shown is the same as the denotation of *some*. It may be, as discussed previously, that the use of the lattice supremum captures the properties of the NPs more exactly, and the required semantics could replace the existential quantifier in (5-42b).

In contrast to the above approach, the generalised quantifier account proposes the following syntactic and semantic representations for *some of the men:*

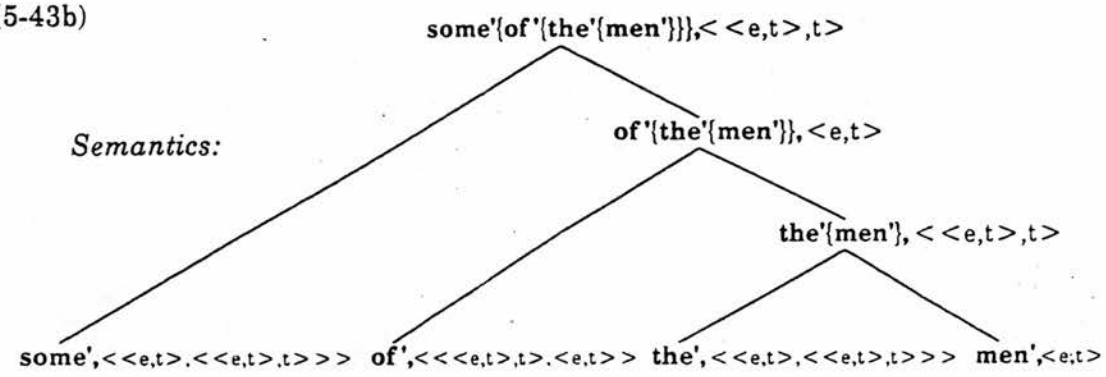
(5-43a)

Syntax:



The associated semantic tree is:

(5-43b)



The following translations, all of which are discussed in detail above, are assumed for the lexical items where E is the (ordered) domain of discourse and X and A are subsets of E:

men'	$\|\!\|{}^{*}men\|\!\|$
the'(A)	$\{ X \subseteq E \mid \sup_i A \in X \}$
of'	$\{ x \mid x \,\Pi\, (\cap \|\!\|NP\|\!\|) \}$
some'(A)	$\{ X \subseteq E \mid X \cap A \neq \varnothing \}$

The elements in (5-43b) will therefore compose as follows:

the'(men')	$\{ X \subseteq E \mid \sup_i \|\!\|{}^{*}men\|\!\| \in X \}$
of'(the'(men'))	$\{ x \mid x \,\Pi\, (\cap \{ X \subseteq E \mid \sup_i \|\!\|{}^{*}men\|\!\| \in X \}) \}$

This expression for *of the men* will reduce to the common noun denotation, as required. Firstly, note that:

$$\cap \{ X \subseteq E \mid \sup_i \|\!\|{}^{*}men\|\!\| \in X \} = \sup_i \|\!\|{}^{*}men\|\!\|$$

The example denotations for the posets in section 5.2.4. above were used to show this. Generating the individuals from the supremum results in the desired common noun denotation:

$$\{ x \mid x \,\Pi\, \sup_i \|\!\|{}^{*}men\|\!\| \} = \|\!\|{}^{*}men\|\!\|$$

Finally, therefore, the semantics for *some of the men* is provided:

$$\textbf{some'(of'(the'(men')))} = \{ X \subseteq E \mid X \cap \|\!\|{}^{*}men\|\!\| \neq \varnothing \}$$

This is the set of sets whose intersection with the lattice generated by the supremum of *the men* is non-null. I suggest that the latter derivation is rather more complicated than the SIP version, involving type-raising, type-lowering, intersection, and the operation to generate posets from individuals. Given the syntactic analysis which was proposed in chapter 2, and which was motivated independently of the semantics, the treatment of demonstratives as adjectives seems simpler.

It was also pointed out above that the standard generalised quantifier approach has to allow the type lowering (intersection) operation in cases where *of* does not appear (*all the men, both the women*, and so on). Link's formulation must also allow the posets to be generated from individuals at the same time if a uniform account of the semantics of specifiers is to be preserved. The SIP grammar requires neither of these operations and can happily stipulate that *of* is merely a syntactic case-marker which plays no part in the semantics.

5.5. Summary

As stated in the introduction to semantics in chapter 4, the latter chapters must be seen as pointing to interesting possibilities rather than drawing firm conclusions. Some of the formal approaches which were investigated appear to be very promising; for instance, Link's use of lattice theory as described in this chapter allows many problematic facts which are not discussed fully above to be handled, notably the correspondence between plural and mass nouns. Similarly, Löbner's (1986) arguments concerning relational nouns may explain some otherwise recalcitrant data such as the distinctions between extraposition possibilities which appear to depend on the semantic characteristics of the head noun. Barwise and Cooper's (1981) use of generalised quantifiers also captures many facts which are not reported here; my main concern was to point out some

problems in the particular area of the theory which relates to partitives. The most important conclusion I wish to draw here is that the generalised quantifier account of definiteness may not be the best option and that some variant of the adjectival approach may be more suitable.

Chapter 6

Conclusions

6.1. Introduction

This chapter is in two main sections. The first summarises the aims of the thesis and the contents of each chapter while the second assesses the results and suggests further developments based on the work of the previous chapters.

6.2. Summary

The initial aim was to expand on the GPSG85 account of NP structure. This has clearly been achieved as there is no analysis of partitives (nor, of course, of pseudopartitives) in Gazdar et al. (1985). However, as the NP grammar in the latter book is intended mainly for general expository purposes, extending the coverage was not a particularly difficult task. More seriously, it was also suggested in the introduction that an explicit and theoretically motivated approach to language modelling is a laudable aim, and the work in chapters 2 and 3 can be understood as an attempt to satisfy these criteria. It was also argued in the introduction that the grammar should overgenerate as little as possible, and it was pointed out in the text that various kinds of overgeneration which are inherent in the standard analyses have been avoided. The precise model which is proposed was related to some standard semantic theories in chapters 4 and 5. The rest of this section provides a review of the important issues which were discussed in each chapter and briefly summarises the arguments.

In order to provide background to the SIP grammar, chapter 1 looked at various

existing approaches to partitive and pseudopartitive NPs. Apart from introducing the basic data, the aim of this chapter was to criticise the accounts of the structure of NPs which appear in Stockwell et al. (1973), Jackendoff (1977), and Selkirk (1977). These accounts are still influential, and various problems were mentioned with the argumentation and data. On the latter, it was argued that introspected judgements on a small number of sentences can be misleading, and evidence was presented which contradicts the assumptions of Jackendoff and Selkirk in particular. The central issue was the question of whether or not partitive NPs contain two NP nodes, and the chapter concludes by suggesting that there is little independent evidence to support the position that partitives contain a PP or NP node under the matrix NP.

Chapter 2 introduced the SIP grammar development environment and proposed an account of the structure of partitives which minimises the distinction between these and simple NPs. In support of this general approach, it was pointed out that the genitive partitives which appear in many languages, including Old English, may be more closely related to the modern English forms than the surface facts suggest. The grammar for partitives which is presented in the chapter accounts for various problematic issues by assuming that a partitive is basically a single NP, in contrast to the analyses which were reviewed in chapter 1. It was noted that the account proposed in Jackendoff (1977) uses a number of mechanisms which are not necessary in the SIP grammar in order to handle the data. It was also argued that the formalisation can be extended fairly easily to account for data from other languages such as French and Italian. The chapter also included a detailed discussion of the possible use of lexical rules to capture the intuition that specifiers have one lexical entry which captures both simple NPs and partitives.

In chapter 3 the analysis was extended to include NPs in which more than one

specifier appear and also to cover pseudopartitives and some minor constructions. The multiple specifier cases were handled by introducing a class of adjectival specifiers to the grammar and this analysis was adapted to cover double specifiers in partitives. The chapter contains a close examination of some of the complex specifier elements which appear in pseudopartitive structures, and a new category (QDet) was introduced in order to distinguish between *a(n)* as it appears in *a number* from the specifier *a(n)* in *a student*. The SIP grammar rules were reviewed and the chapter concluded by briefly comparing the analysis with the relevant parts of the Alvey grammar (Grover et al. 1989).

In chapters 1, 2, and 3 a number of claims were made about the relationship between definiteness and partitives. Chapter 4 therefore attempted to provide the background for a characterisation of definiteness by looking at various approaches in the semantics literature. Montague grammar as it appears in GPSG85, generalised quantifier theory, boolean algebras, and DRT were all discussed. It was suggested that there is no single candidate theory which captures all the necessary facts, particularly if some form of incremental interpretation is required. The aim of this chapter was therefore to review the issues and to characterise as clearly as possible the criteria which a semantic theory would have to fulfil if it were to provide a satisfactory account of partitives. The chapter introduced the basic type-theoretic framework which forms the basis for the SIP semantics in chapter 5 and described the GPSG85 use of syntactic and semantic rule pairs. An extensive review of Barwise and Cooper (1981) was provided in order to introduce generalised quantifier theory and it was suggested that the account of definiteness which is proposed in the 1981 paper is unsatisfactory. Some amendments to the theory which are proposed in Ladusaw (1982) were discussed and Löbner's (1986) criticisms of Barwise and Cooper were reviewed. The chapter concluded by introducing DRT

(Kamp 1981) and by looking at the approach to definiteness in the version of DRT which is proposed by Zeevat (1989a, 1989b).

Chapter 5 extended the background to semantics by looking at work on plurals and further approaches to DRT. It was suggested that the work of Link (1983, 1986a, 1986b) provides a very promising framework within which to study NP semantics and the possibility of using lattice theory in van Eijck's (1986) approach to semantics was considered. It was argued that the standard generalised quantifier account of definiteness becomes particularly unwieldy in Link (1986a) and an alternative semantics for the definite article was proposed. Finally, semantic operations were associated with most of the SIP grammar rules and some example derivations were provided for the NPs *some of the men* and *the men* which contrasted the generalised quantifier and SIP approaches.

6.3. Further Research

Taking the syntactic rules first, there are a number of possible improvements. One relatively trivial point is that, as mentioned frequently in chapters 2 and 3, the adoption of a general notion of head-hood would simplify many of the rules and FP statements. This can easily be achieved; the head of each rule was usually pointed out in the text. It was noted that some rules can be interpreted as having two heads, as Cann (1989) argues, and the **NP → SpecP N1** rule in the grammar contains a particular implementation of this notion. (Strictly speaking, it is the combination of the lexical entries and the rules which implement the proposal.) Further work in this area might prove fruitful in characterising the nature of the notion 'head' more precisely. Another fairly trivial issue concerns the analysis of NPs such as *every one of the boys*; it was pointed out in the text (chapter 3) that the solution which is provided in the grammar is not particularly satisfactory; for one thing, it might be considered

desirable to generalise such uses to cover NPs like *every two days* and *any two of the students*. The particular solution to the problem which is proposed in the grammar cannot easily be extended to include the latter examples.

The analysis of double specifier constructions in partitives in chapter 3 is not entirely satisfactory, as was pointed out in the text. The account captures many aspects of the structures, but the solution proposed, which involved complicating the adjective rule quite considerably, may not be optimal. Perhaps, as was suggested, the relationship between specifying elements and N1s should be stated generally in the **NP → SpecP N1** rule(s), whatever class the elements themselves seem to have.

One important issue which the thesis touches on without exploring in any depth is the relationship between case-marking as it is assumed in the SIP analysis and morphological case-marking. The assumption that partitive phrases are case-marked nominals allows many problems to be handled in a reasonably concise manner, and it was pointed out that the 'morphological' partitives such as the Old English examples provide a model for the analysis in chapter 2. However, there are many related concerns which are not investigated. It would be interesting, for example, to look at languages which have morphological definiteness, such as Turkish and (to some extent) Finnish, and to compare the analysis which has been proposed here for English with the relevant data. The discussion of case-marking and definiteness in Comrie (1981) may provide a starting point for such a study, and my claim would be that an account of definiteness which relies on a generalised quantifier style NP semantics for the nominals in question will prove to be inappropriate.

The last point leads to the question of what the implications of the chapters on semantics are. It was suggested on various occasions in chapters 4 and 5 that the work presented was inconclusive. There seem to be two main areas which

require to be researched fully in order to provide the basis for a satisfactory account of the semantics of partitives. Firstly, it was noted that an incremental semantics is desirable and it was pointed out that, as the standard DRT assumption is that input is processed sentence by sentence, some alterations to the theory may be necessary if it is to explain the problematic extraposition examples which were discussed in chapter 1 and elsewhere. An approach which assimilates the work of Haddock (1988, 1990) may prove fruitful. The second semantic area which remains unsatisfactory concerns the relationship of DRT to semantic theories such as generalised quantifiers. It was noted that Zeevat (1989a, 1989b) has formulated an account of definiteness within DRT which includes a notion of compositionality, and also that van Eijck's approach to quantification and DRT may have some interesting consequences, but certain parts of the thesis suffer from the lack of a comprehensive theory, as was noted on occasion. There is a lot of promising research which was not discussed which may help to provide answers, for example, the work on threading in Unification Categorial Grammar (e.g. Calder et al. 1987). In general, perhaps the most interesting direction is towards a well-defined notion of 'dynamics' in semantics, interpreting this to be partly an account of how meanings relate to each other across time.

Finally, a number of problems have been addressed, some solutions have been proposed, a large amount of effort has been expended, and the several of the problems which proved tractable have been solved. Also, any grammar which can parse most of the NPs in this paragraph should provide a basis for solving the remaining few difficulties.

Appendix A

Grammar Listing

A.1. Introduction

This appendix contains a working version of the grammar which is described in chapters 2 and 3. There are four main sections, which deal with the grammar, the lexicon, the parsing environment, and the test data. On occasion, the demands of the compiler mean that there are slight differences between the description in the earlier chapters and the actual implementation below. Perhaps the most noticeable discrepancy concerns the use of sorted variables in the SIP system. It was mentioned briefly in the text that the SIP grammar has the option of using typed variables. This is not particularly interesting as far as the NP grammar as it stands is concerned; the variable sorts are used mainly to implement collocational restrictions in CSTR grammars. However, the variable ranges must be declared, and the required list is included below.

Some notational differences should also be mentioned. Firstly, Lisp structure is often used where the text contained square brackets. Secondly, partly due to the fact that variables are sorted, the exclamation mark is used instead of the dollar sign as the variable prefix. Also, instead of using numbers to identify variables, alphabetic characters are employed. Thus where the text contains specifications such as [Cm $1], the rules below have [Cm !cm]. The reason for this is simply that it is easier to remember the range of a variable if the names are mnemonic.

A.2. Grammar

The grammar is presented here in four sections. The first describes the various declarations which are required, the second contains the phrase structure rules, and the third lays out the feature propagation rules. The last section provides an example of a compiled rule and briefly discusses the compilation process.

A.2.1. Declarations

There are four types of declaration in all, dealing with feature ranges, the make-up of syntactic categories, variable ranges, and aliases. These declarations are used for a variety of purposes, including error detections during compilation as an aid to debugging grammars, as a method of stating defaults, and as a method of making PS rules concise. Firstly, the range of values which features can take is declared as follows:

Features

(Cm (of −))
(ArgCm (− of))
(Def (− +))
(ArgDef (− +))
(Num (pl sg))
(ArgNum (pl sg))
(Ms (− +))
(ArgMs (− +))
(V (− +))
(N (− +))
(Bar (0 1 2))
(Cat (spec qdet det pcm int))
(Spec (− + qdet))
(Subs (+ −))
(Qu (+ −))
(Agr Category)
(ArgAgr Category)

Secondly, the makeup of each syntactic category must be specified. The

following statements are therefore necessary:

Categories
(NP (Bar 2) (V −) (N +) Agr)
(N1 (Bar 1) (V −) (N +) Agr ArgAgr ArgDef ArgCm Def Cm Spec Qu)
(Noun (Bar 0) (V −) (N +) Agr ArgAgr ArgDef ArgCm Spec Qu)
(SpecP (Cat spec) (Bar 2) Agr ArgAgr ArgDef ArgCm)
(Spec (Cat spec) (Bar 0) Agr ArgAgr ArgDef ArgCm Subs)
(Det (Cat Det) Agr)
(Pcm (Cat Pcm) Cm)
(Qdet (Cat qdet))
(AdjP (Bar 2) (V +) (N +) Agr ArgDef ArgCm ArgAgr Spec)
(Adj (Bar 0) (V +) (N +) Agr ArgDef ArgCm ArgAgr Spec)
(Int (Cat int))
(Agr Ms Num)

Where explicit values are not given for a feature a category will be expanded to include a variable value for the declared feature names. As mentioned in the text, the use of term unification by the parser means that certain kinds of underspecification are impossible. It might be considered inelegant, for example, that all adjectives require to have the features *ArgDef, ArgCm* and *ArgAgr* instantiated, even though they are really only relevant to the [+Spec] adjectives. However, in practice the grammar rules can often ignore the unused features. Note that *Agr* is declared as a category; the compiler insists that all categories which are used in the grammar and lexicon should be declared, and as mass and number features make up the category which is the value of *Agr* and *ArgAgr*, the category must be named in the declarations.

As mentioned previously, variable ranges need to be stated. In the following declarations the use of *@feature-name* signifies that the variable range is the same as the range of the feature as specified above:

Variables

```
(!num   @Num)
(!ms    @Ms)
(!def   @Def)
(!cm    @Cm)
(!agr   @ArgAgr)
(!agr2  @ArgAgr)
(!subs  @subs)
(!qu    @qu)
(!spec  @spec)
(!specs (+ -))
```

Finally, the following aliases are used in the rules:

Aliases

```
(NP          ((V -)(N +)(Bar 2)))
(N1          ((V -)(N +)(Bar 1)))
(N           ((V -)(N +)(Bar 0)))
(SpecP       ((Cat spec)(Bar 2)))
(Spec        ((Cat spec)(Bar 0)))
(Det         ((Cat det)))
(Pcm         ((Cat pcm)))
(QDet        ((Cat qdet)))
(AdjP        ((V +)(N +)(Bar 2)))
(Adj         ((V +)(N +)(Bar 0)))
(Int         ((Cat int)))
```

A.2.2. Phrase Structure Rules

The following are the PS rules, starting with the three NP rules as described in chapter 2. Each rule is given an identifying name, which can be used to examine the compiled form. The first NP rule combines SpecPs and N1s to form NPs:

```
NP.1 :
   [NP, Agr !agr]   >
            [SpecP, ArgAgr !agr, ArgDef !def, ArgCm !cm],
            [N1, Agr !agr, Def !def, Cm !cm, -Spec]
```

The next two rules analyse mass and definite N1s as NPs:

NP.2 :

[NP, Agr [Num !num, +Ms,]] >
[N1, −Def, −Cm, Agr [Num !num, +Ms], −Spec]

NP.3 :

[NP, Agr !agr] >
[N1, Agr !agr, +Def, −Cm, −Spec]

As described in the text, there are five specifier phrase rules. The first analyses lexical specifiers as SpecPs (*each, some,* and so on), the second allows the adjectival specifiers to make phrases (*few, many,* etc), the third handles the quantifying nouns (*a number, an amount,* etc), and the fourth accounts for the complex adjectival specifiers *a few* and *a little.* The last one is the most complicated; it allows a [−Subs] specifier to combine with a [+Spec] adjective to form a SpecP. In practice, this is really only done to provide an analysis for *every one*, although it also allows *each one* and *any one* as *each* and *any* are given variable values for [Subs]. The latter two specifiers can therefore fit the first specifier rule also.

SpecP.1 :

SpecP >
Spec

SpecP.2 :

SpecP >
[AdjP, +Spec]

SpecP.3 :

SpecP >
QDet,
[N1, +Qu]

SpecP.4 :

SpecP >
QDet,
[AdjP, Spec qdet]

SpecP.5 :

[SpecP, ArgCm of, Agr !agr2] >
[Spec, −Subs, ArgAgr !agr2],
[Adj, +Spec, Agr !agr2]

The next three rules are all of the form **N1 → XP N1**. The first is the adjective rule, which is recursive unless a [+Spec] adjective is added. As described in the text, this rule also allows [+Spec] adjectives to form partitives such as *the few of the men* alongside the simple version *the few men*.

N1.1 :

[N1, Agr !agr, −Def, −Cm, Spec !spec] >
[AdjP, Spec !spec, ArgAgr !agr, ArgCm !cm, ArgDef !def],
[N1, Agr !agr, Def !def, Cm !cm, −Spec]

The following rule analyses demonstratives, and basically adds the feature [+Def] to N1s:

N1.2 :

[N1, Agr !agr, −Cm, +Def, −Spec] >
[Det, Agr !agr],
[N1, Agr !agr, −Cm, −Def, Spec !specs]

The next rule allows case-marking of N1s. The actual marking comes from the preposition and is passed to the mother:

N1.3 :

[N1, Cm !cm] >
[Pcm, Cm !cm],
[N1, −Cm]

The last nominal rule below analyses lexical nouns as N1s. In a more complicated grammar, further lexical rules would be used to add sub-categorised constituents at this level:

Noun :

[N1, −Def, −Cm] >
N

Finally, the last PS rule is the adjective phrase rule, which allows an adjective to be modified by an intensifier. Note that this is the only rule with an optional constituent (marked by the use of the question mark). The compiler will expand the AdjP rule into two FBF rules, one with and one without the intensifier:

```
AdjP :
   AdjP   >
              Int ?,
              Adj
```

A.2.3. Feature Propagation Rules

There are six feature propagation rules which are used to do most of the feature passing in the PS rules above. As discussed in the text, these could quite easily be reduced in number by explicitly marking heads in rules and passing the required features from head daughters to mothers. The first does part of the work of the HFC in ensuring that head features on nominal mothers typically come from nominal daughters:

```
{Agr, ArgAgr, ArgDef, ArgCm, Def, Cm, Spec, Qu}
                              [N1, ¯F], @F : [+N, −V, ¯F], @F
```

The next four rules all pass features to specifier phrases. These could certainly be condensed if heads were marked:

```
{Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [+Spec, ¯F], @F
{Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [+Qu, ¯F], @F
{Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [Spec, ¯F], @F
{Agr, ArgAgr, ArgDef, ArgCm} [SpecP, ¯F], @F : [Spec qdet, ¯F], @F
```

Finally, the rule below passes features from adjectives to the maximal projection:

```
{Agr, ArgAgr, ArgDef, ArgCm, Spec} [AdjP, ¯F], @F : [Adj, ¯F], @F
```

Note that FP rules have not been used to implement the CAP; the discussion of

this principle in the text noted the difficulty involved in making an elegant declaration in the SIP system. The relevant rules (NP.1, N1.1, N1.2, SpecP.5), in which certain features on daughters must agree, explicitly state the requirements.

A.2.4. Compiled Rules

This section introduces an example of a compiled rule. The chosen case is the first compiled AdjP rule; the high level representation of this which is stated above is:

```
AdjP :
   AdjP   >
              Int ?,
              Adj
```

As mentioned previously, there are two compiled forms of this rule, one with and one without the intensifier. The version containing the intensifier is:

```
((BAR 2) (V +) (N +) (AGR 1643) (ARGDEF 1644) (ARGCM 1645) (ARGAGR 1646) (SPEC 1647))
((CAT INT))
((BAR 0) (V +) (N +) (AGR 1643) (ARGDEF 1644) (ARGCM 1645) (ARGAGR 1646) (SPEC 1647))
```

The aliases have been expanded, so that, for example, AdjP becomes ((BAR 2) (V +) (N +)). The last FP rule above has also applied:

{Agr, ArgAgr, ArgDef, ArgCm, Spec} [AdjP, ~F], @F : [Adj, ~F], @F

As described in chapter 2, this says that any rule with an AdjP mother and an Adj daughter has the features *Agr, ArgAgr, ArgDef, ArgCm,* and *Spec* added to both mother and daughter, and the values must unify. The result is the fully specified rule as shown. An example of a compiled lexical entry is provided at the end of the lexicon listing below.

A.3. Lexicon

This lexicon contains 36 entries, covering most of the important items discussed in the text. Where items mentioned in the text are not included below, this should be because they have the same lexical entry as a given form which should be identifiable from the original discussion. There is no need for explicit comments below as there is no difference between the entries provided and the examples which were given in the text apart from the use of Lisp structure instead of square brackets and, as mentioned in the introduction to the PS rules above, the different representation of variables.

A.3.1. Lexical Entries

```
(a  (Spec (Agr ((Num sg) (Ms −)))
     (ArgAgr ((Num sg) (Ms −))) (ArgDef −) (ArgCm −) (Subs +))
   (QDet))

(all  (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms +))) (ArgDef −) (ArgCm −) (Subs +))
     (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms !ms))) (ArgDef +) (Subs +)))

(an  (Spec (Agr ((Num sg) (Ms −)))
      (ArgAgr ((Num sg)  (Ms −))) (ArgDef −) (ArgCm −) (Subs +))
    (QDet))

(any  (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms +))) (ArgDef −) (ArgCm −) (Subs +))
     (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms !ms))) (ArgDef +) (ArgCm of) (Subs +))
     (Spec (Agr ((Num sg) (Ms −)))
       (ArgAgr ((Num sg) (Ms −))) (ArgDef −) (ArgCm −)))

(both  (Spec (Agr ((Num pl) (Ms +)))
        (ArgAgr ((Num pl) (Ms !ms))) (ArgDef −) (ArgCm −) (Subs +)))

(each  (Spec (Agr ((Num sg) (Ms −)))
        (ArgAgr ((Num sg) (Ms −))) (ArgDef −) (ArgCm −))
      (Spec (Agr ((Num sg) (Ms −)))
        (ArgAgr ((Num pl) (Ms +))) (ArgDef +) (ArgCm of) (Subs +)))
```

```
(every (Spec (Agr ((Num sg) (Ms −)))
       (ArgAgr ((Num sg) (Ms −))) (ArgDef −) (ArgCm −) (Subs −)))

(few (Adj (Spec +) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef −) (ArgCm −))
     (Adj (Spec +) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef +) (ArgCm of))
     (Adj (Spec qdet) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef −) (ArgCm −))
     (Adj (Spec qdet) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef +) (ArgCm of)))

(large (Adj (ArgCm −) (Spec −)))

(little (Adj (ArgCm −) (Spec −))
        (Adj (Spec +) (Agr ((Num sg) (Ms +)))
          (ArgAgr ((Num sg) (Ms +))) (ArgDef −) (ArgCm −))
        (Adj (Spec +) (Agr ((Num sg) (Ms +)))
          (ArgAgr ((Num sg) (Ms !ms))) (ArgDef +) (ArgCm of))
        (Adj (Spec qdet) (Agr ((Num sg) (Ms +)))
          (ArgAgr ((Num sg) (Ms +))) (ArgDef −) (ArgCm −))
        (Adj (Spec qdet) (Agr ((Num sg) (Ms +)))
          (ArgAgr ((Num sg) (Ms !ms))) (ArgDef +) (ArgCm of)))

(man (N (Qu −) (Agr ((Num sg) (Ms −)))))

(many (Adj (Spec +) (Agr ((Num pl) (Ms +)))
        (ArgAgr ((Num pl) (Ms +))) (ArgDef −) (ArgCm −))
      (Adj (Spec +) (Agr ((Num pl) (Ms +)))
        (ArgAgr ((Num pl) (Ms +))) (ArgDef +) (ArgCm of)))

(men (N (Qu −) (Agr ((Num pl) (Ms +)))))

(much (Spec (Agr ((Num sg) (Ms +)))
        (ArgAgr ((Num sg) (Ms +))) (ArgDef −) (ArgCm −) (Subs +))
      (Spec (Agr ((Num sg) (Ms +)))
        (ArgAgr ((Num sg) (Ms !ms))) (ArgDef +) (ArgCm !Cm) (Subs +)))

(no (Spec (Agr ((Num !num) (Ms +)))
      (ArgAgr ((Num !num) (Ms +))) (ArgDef −) (ArgCm −) (Subs +))
    (Spec (Agr ((Num sg) (Ms −)))
      (ArgAgr ((Num sg) (Ms −))) (ArgDef −) (ArgCm −) (Subs +)))

(number (N (Qu +) (Agr ((Num pl) (Ms +)))
        (ArgAgr ((Num pl) (Ms +))) (ArgDef !def) (ArgCm of)))

(of (Pcm (Cm of)))
```

```
(one (Adj (Spec +) (Agr ((Num sg) (Ms -)))
       (ArgAgr ((Num sg) (Ms -))) (ArgDef -) (ArgCm -))
     (Adj (Spec +) (Agr ((Num sg) (Ms -)))
       (ArgAgr ((Num pl) (Ms +))) (ArgDef +) (ArgCm of)))

(other (Adj (ArgCm -) (Spec -)))

(red (Adj (ArgCm -) (Spec -)))

(several (Adj (Spec +) (Agr ((Num pl) (Ms +)))
          (ArgAgr ((Num pl) (Ms !ms))) (ArgDef -) (ArgCm -))
         (Adj (Spec +) (Agr ((Num pl) (Ms +)))
          (ArgAgr ((Num pl) (Ms !ms))) (ArgDef +) (ArgCm of)))

(small (Adj (ArgCm -) (Spec -)))

(some (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms +))) (ArgDef -) (ArgCm -) (Subs +))
      (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms !ms))) (ArgDef +) (ArgCm of) (Subs +))
      (Spec (Agr ((Num singular) (Ms -)))
       (ArgAgr ((Num singular) (Ms -))) (ArgDef -) (ArgCm -) (Subs +)))

(student (N (Qu -) (Agr ((Num sg) (Ms -)))))

(students (N (Qu -) (Agr ((Num pl) (Ms +)))))

(that (Det (Agr ((Num sg) (Ms !ms)))))

(the (Det))

(these (Det (Agr ((Num pl) (Ms !ms)))))

(this (Det (Agr ((Num sg) (Ms !ms)))))

(those (Det (Agr ((Num pl) (Ms !ms)))))

(three (Adj (Spec +) (Agr ((Num pl) (Ms +)))
          (ArgAgr ((Num pl) (Ms !ms))) (ArgDef -) (ArgCm -))
       (Adj (Spec +) (Agr ((Num pl) (Ms +)))
          (ArgAgr ((Num pl) (Ms !ms))) (ArgDef +) (ArgCm of)))

(two (Adj (Spec +) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef -) (ArgCm -))
     (Adj (Spec +) (Agr ((Num pl) (Ms +)))
       (ArgAgr ((Num pl) (Ms !ms))) (ArgDef +) (ArgCm of)))

(very (Int))

(wine (N (Qu -) (Agr ((Num sg) (Ms +)))))
```

(*woman* (N (Qu −) (Agr ((Num sg) (Ms −)))))

(*women* (N (Qu −) (Agr ((Num pl) (Ms +)))))

A.3.2. Compiled Lexical Entries

The following entry is given above for *all*:

```
(all  (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms +))) (ArgDef −) (ArgCm −) (Subs +))
     (Spec (Agr ((Num !num) (Ms +)))
       (ArgAgr ((Num !num) (Ms !ms))) (ArgDef +) (Subs +)))
```

The compiled forms of the actual entries are:

```
((CAT SPEC) (BAR 0) (AGR ((MS +) (NUM 1730)))
        (ARGAGR ((MS +) (NUM 1730))) (ARGDEF −) (ARGCM −) (SUBS +))
((CAT SPEC) (BAR 0) (AGR ((MS +) (NUM 1727)))
        (ARGAGR ((MS 1728) (NUM 1727))) (ARGDEF +) (ARGCM 1729) (SUBS +))
```

The only point to note here is that the second entry for *all* has been expanded to include the feature *ArgCm*. The category definition for specifiers given in section 2.1 above ensures that this feature is added with a variable value. Note also that the same operation applies to any category which is underspecified in a syntactic rule.

A.4. Parsing Environment

This section looks briefly at the actual operation of the parser and at its output. There are two modes of operation, one in which the parser prompts for input and one in which it takes strings from a file. In the first mode the output is displayed immediately as a Lisp list, in the second the lists are printed to a file.

The following outlines the use of the two modes in parsing the example strings *the few of the women* and *much of the wine*. Firstly, in single string mode, the parser prompts the user as follows:

```
Parse Sentence
Sentence ?
```

The string to be parsed can then be typed, and the result for *the few of the women* is shown below:

```
Parse Sentence
Sentence ? the few of the women

(NP
 (N1
  (DET THE)
  (N1
   (ADJP
    (ADJ FEW))
   (N1
    (PCM OF)
    (N1
     (DET THE)
     (N1
      (NOUN WOMEN)))))))

Parsed: 1 complete parse found
Finished parsing sentence(s).
```

In this instance, and in most of the examples below, all information on categories has been suppressed apart from the category name. One case is shown below where more information is represented. In batch parse mode, as mentioned above, the parser will take input from a file and print the string and any parses to an output file. For the two example sentences suggested above, the input file would contain just the strings, separated by linefeeds:

```
The few of the women
Much of the wine
```

Running the parser in this mode requires setting some background parameters, after which the following on-screen information is displayed:

```
Reading sentences from file Input
Outputting parses to file Parses.lst

Parser started at Wednesday 25-April-1990 11:21:41

Parsed Sentence(s) :-
1 2

Parser finished at Wednesday 25-April-1990 11:21:42
Parsed output in Parses.lst
Finished parsing sentence(s).
```

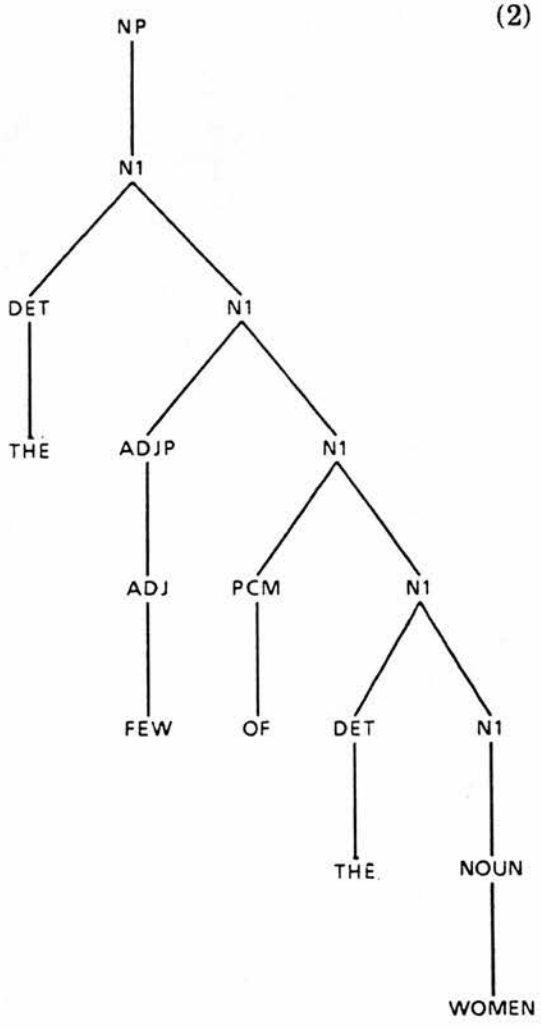
The output file contains the Lisp expressions below:

```
((THE FEW OF THE WOMEN )

 (NP
  (N1
    (DET THE)
    (N1
      (ADJP
        (ADJ FEW))
      (N1
        (PCM OF)
        (N1
          (DET THE)
          (N1
            (NOUN WOMEN)))))))

((MUCH OF THE WINE )

 (NP
  (SPECP
    (ADJP
      (ADJ MUCH)))
  (N1
    (PCM OF)
    (N1
      (DET THE)
      (N1
        (NOUN WINE)))))))
```

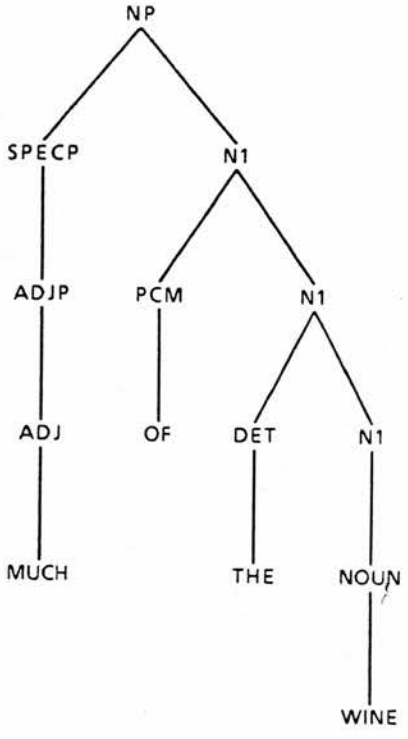
Due to the difficulty in interpreting such Lisp expressions, software was

developed to display the output files on Xerox D-Machines. These functions will read the file 'Parses.lst' (the output of the example parse run above) and display the information as the tree structures below:

(1)



(2)



It is possible, and often necessary, to look at fuller representations of the categories. For the simple NP *every man*, the complete category specifications involved in a parse are:

```
Parse Sentence
Sentence ? every man

(NP [
  ((AGR (AGR (-MS (NUM SG))))) ]
  (SPECP [
    ((AGR (AGR (-MS (NUM SG))))
      (ARGAGR
        (AGR
          (-MS (NUM SG))))
      -ARGDEF
      -ARGCM) ]
    (SPEC [
      ((AGR (AGR (-MS (NUM SG))))
        (ARGAGR
          (AGR
            (-MS (NUM SG))))
        -ARGDEF
        -ARGCM
        -SUBS) ] EVERY))
  (N1 [
    ((AGR (AGR (-MS (NUM SG))))
      (ARGAGR <FVI2872> RANGE CATEGORY)
      (ARGDEF <FVI2873> RANGE (+ -))
      (ARGCM <FVI2874> RANGE (- OF))
      -DEF
      -CM
      -SPEC
      -QU) ]
    (NOUN [
      ((AGR (AGR (-MS (NUM SG))))
        (ARGAGR <FVI2872> RANGE CATEGORY)
        (ARGDEF <FVI2873> RANGE (+ -))
        (ARGCM <FVI2874> RANGE (- OF))
        -SPEC
        -QU) ] MAN)))

Parsed: 1 complete parse found
Finished parsing sentence(s).
```

Although such structures are daunting at first, they are actually relatively easy to interpret given the information provided above on the makeup of categories. Perhaps the most recondite specifications are the values given for the features *ArgAgr*, *ArgDef* and *ArgCm* on the N1 and noun nodes. The information is the result of the fact that these features are not given in the lexical entry for *man*,

and so, as discussed elsewhere, they are added to the category by FP rules or by the category definition. Thus '(ARGDEF <FVI2873> RANGE (+ −))', for example, represents the information that the feature *ArgDef* has a variable value, and the range of values that the variable can take is given by the set {+, −}. The latter information comes, of course, from the variable declarations as shown above.

A.5. Example NPs

Finally, some example NPs to test the grammar. There are 159 test strings in all, and each NP in the first set of 52 is given a single parse by the grammar. The rest are rejected. Nearly all the parsed NPs are acceptable, according to my intuitions, apart from some cases containing the adjectival analysis of *much*, as in ?**the much wine* and ?**the much of the wine*. None of the rejected strings are, I think, grammatical. Some comments are added at appropriate places below.

Parsed examples:

One of the three of the many men
Any one of the men
Any of the wine
Any of the men
Any of the man (cf. *did you read any of the book?*)
The much of the wine
The much of the man
Very much of the wine
Very much of the man (cf. *much of the table was charred*)
The much wine
Much of the wine
Much of the man
Much wine
Every man
Every one of the men
Each of the men
Each one of the men

A very little wine (*little* as a [+Spec] adjective)
A very little man (*little* as a [−Spec] adjective)
A little wine
A little man (*little* as a [−Spec] adjective)
A very few men
A few men
Some of the few men
The many large men
Many large men
A number of the men
A very large number of the students
A large number of women
A number of men
Some of the many women
The very many of the women
The few of the many men
The few of the men
Some of the wine
Some of the men
Some of the man (cf. *some of the room had been painted*)
Many of the men
The many men
Those men
These men
The wine
The men
The man
All wine
All men
All the wine
All of the wine
All the men
All of the men
All the man (cf. *all the floor was damp*)
All of the man

Rejected NPs:

One of the three of the many wine
One of the three of the many man
Any one of the wine
Any one of the man
The much of the men

Very much of the men
The much men
The much man
A much wine
A much men
A much man
Much of the men
Much men
Much man
Every wine (Acceptable as *every kind of wine*, in which *wine* is [−Ms]
Every men
Every one of the wine
Every one of the man
Every of the wine
Every of the men
Every of the man
Each of the wine
Each of the man
Each one of the wine
Each one of the man
A very little men
A little men
A very few wine
A very few man
A few wine
A few man
The a few wine
The a few men
The a few man
Some of few wine
Some of few men
Some of few man
Some of the few wine
Some of the few man
The many large wine
The many large man
Many large wine
Many large man
Large of the wine
Large of the men
Large of the man
Large many wine

Large many men
Large many man
A number of the wine
A number of the man
A very large number of the wine
A very large number of the student
A large number of wine
A large number of woman
A number of wine
A number of man
The few of wine
The few of men
The few of man
Some many wine
Some many women
Some many woman
Some of the many wine
Some of the many woman
Some of many wine
Some of many women
Some of many woman
The very many of the wine
The very many of the woman
The few of the many wine
The few of the many man
The few of the wine
The few of the man
Some the wine
Some the men
Some the man
Many of wine
Many of men
Many of man
Many of the wine
Many of the man
Many the wine
Many the men
Many the man
The many wine
The many man
Those wine
Those man

These wine
These man
Of the wine
Of the men
Of the man
The all of the wine
The all of the men
The all of the man
The all of wine
The all of men
The all of man
The all wine
The all men
The all man
All of wine
All of men
All of man
All man

Appendix B

Grammaticality Test

B.1. Introduction

This appendix contains a listing of an experiment in soliciting grammaticality judgements from a small set of subjects. As noted in chapter 1, only thirteen people in all had the time to undergo the test, and so the results can hardly be claimed to be comprehensive. Many factors could have been varied, or simply changed, in order to gain more reliable indications; for one thing, it would have been wise to have presented the strings in different orders to different people. Also, the choice of material is often not particularly apt.

However, there is no reason to think that the subjects are unrepresentative and the relevant results are discussed at suitable points in the main text. A listing of the test, which contains 38 sentences, follows as it was presented to the subjects.

B.2. Grammaticality Test

The sentences below are in no particular order. All I'd like is a letter beside each sentence corresponding to something like the following set of judgements:

A. Perfectly ok - I see and/or use this kind of construction all the time.
B. Ok, but not wonderful.
C. Only just acceptable
D. Pretty bad - I might just be able to use this.
E. Completely awful. No-one could say this.

So, for example, you might say that the sentence "I like beans" is an A, while "beans, John likes" is a B, C or D and "beans likes John" is an E. Many of the sentences below are strange without context, which is unavoidable. If you find yourself working hard to think up a context, mark the sentence down a bit. Try not to agonise or go back and

change things. If you have any comments you'd like to make, please feel free.

1. Linguists should get much better pay
2. A number of reviews were published yesterday of Potter's new play
3. On which topic have you prepared a lot of the lectures?
4. Decisions were postponed which needed to be taken
5. I read a lot of the newspapers
6. To which question do you know a lot of answers?
7. A lot of the lectures were given last week on Russian history
8. The problems have been solved which we discussed
9. Of my friends, many are English
10. Some questions were asked on the topic
11. Of which book have you read some reviews?
12. Reviews were published yesterday of Potter's new play
13. On Friday I'm going to a party
14. On which topic have you prepared the lectures?
15. A number of lectures were given last week on economics
16. A lot of the questions were resolved yesterday of liability
17. Every student looked good, but only because there were no students there
18. Of which book have you read a lot of the reviews?
19. Some people have complained who were not told of the decision
20. The decisions were postponed about a new Opera house
21. Of which play have you heard the criticisms?
22. Some reviews were published yesterday of Potter's new play
23. We arrived quite a lot of time after them
24. On which topic have you prepared a lot of lectures?
25. Lectures were given last week on Linguistics
26. Each man kissed Mary, but only because there were no men there
27. Of which play have you heard some criticisms?

28. A number of answers were found yesterday to their questions
29. The lectures were given last week on Russian history
30. Of which book have you read the reviews?
31. The reviews were published yesterday of Potter's new play
32. The politicians agreed, but only because there were no politicians there
33. On which topic have you prepared some lectures?
34. A number of the reviews were published yesterday of Potter's new play
35. Of which book have you read a lot of reviews?
36. We arrived quite some time after them
37. Reviews have been published of Rushdie's new book
38. On which topic did you raise a lot of the questions?

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